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China's Standardization & Intellectual Property Policies:

In Light of WTO Regime and Membership

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China's Standardization & Intellectual Property Policies: In Light of WTO Regime and Membership

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Abstract

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China's policy makers see international standards as a barrier to their country's economic development, more importantly, as an offence to the country's national pride. This belief has been reinforced by the view that multi-national companies have used international standards to force developing countries to deprive them of the ability to enter the international markets by forcing them to pay high royalty rates, due to the patents incorporated in these standards. Moreover, these standards, as they believe, have been created at international standards setting platforms dominated by multi-national companies and developed countries. In return, China has launched several initiatives to create home-made Chinese standards free from patent claims of these companies. China's home-made

standards, some of which differ significantly from international standards, also reportedly serve to protection of its domestic market.

China's accession to the WTO was formally approved in November 2001 and China became the WTO's 143rd member on December 11, 2001. WTO membership opened a new era for China. In spite of the international expectations for removal of all trade protection mechanisms which are incompatible with the international trade regime, China is reported to have sought to reform its policies by employing new strategies concerning IPR and standards.

The thesis of this report is that China has not diverged significantly from developing home-made Chinese standards after the country's entry into the WTO, but Chinese authorities have adopted more flexible strategies to implement this policy. Accordingly, this report is about change in policy strategies. I argue that China has continued to enforce its own will upon foreign companies with a strong self-confidence stemming from its ability to negotiate on unequal terms with foreign companies, owing to its sheer market size. However, China's new strategies have been shaped by weak coordination and disagreement among government agencies and institutions.

To illustrate the potential explanatory power of this account, I have examined two important home-made standards initiatives by China; Wireless Authentication and Privacy Infrastructure (WAPI) and Audio Video Coding Standards (AVS). From the examination of the WAPI and AVS cases, I conclude that China's strategies have continued to evolve through disagreements and negotiations between Chinese government institutions within policy boundaries set by China's WTO membership and increasing international criticism.

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List of Acronyms

AVC - Advanced Video Coding

AVS - Audio Video Coding Standards

CAS - Chinese Academy of Sciences

CBC - China Broadcasting Corporation

CCP - Chinese Communist Party

CDMA - Code Division Multiple Access

CNIS - China National Institute of Standardization

CVD – China Video Disk

DTV - Digital Television

DVD - Dissociated Vertical Deviation

EC - European Commission

EVD - Enhanced Versatile Disc

FCC – United States Federal Communications Commission

FPD - Flat Panel Display

GATT - General Agreement on Tariffs and Trade

GE - General Electric

HDTV - High-definition Television

IEC - International Electrotechnical Commission

IEEE - Institute of Electrical and Electronics Engineers

IPR - Intellectual Property Rights

ISO - International Organization for Standardization

ITRI - Industrial Technology Research Institute

ITU - International Telecommunications Union

JIS - Japanese Industrial Standard

JVC - Japan Victor Corporation

MEI - China Ministry of Electronics Industry

MII - China Ministry of Information and Industry

MITI - Japanese Ministry of International Trade and Industry

MPEG – Moving Pictures Experts Group

MPEG-LA- MPEG Licensing Agency

NHK - Japan Broadcasting Corporation

NIIP - National Indigenous Innovation Products

PCT - International Patent Cooperation Treaty

SAC - Standards Administration of China

SARFT – China State Administration of Radio, Film, and Television

SEMI - Semiconductor Equipment & Materials International

SMPTE - Society of Motion Picture and Television Engineers

SOE – State Owned Enterprise

SPC - Supreme People's Court of China

TBT - Technical Barriers to Trade

TFTC - Taiwan's Fair Trade Commission

TI – Texas Instruments

TIEC - Thailand International Engineering Public Company

TNPC - Taiwan New Personal Computer

TRIPS - Trade Related Aspects of Intellectual Property Rights

TTLA - Taiwan TFT–LCD Association

USITC – US International Trade Commission

VHS - Video Home System

WAPI - Wireless Authentication and Privacy Infrastructure

WTO - World Trade Organization

Chapter 1: Introduction

China's accession to the World Trade Organization (WTO) represents a significant step towards China's integration to the world economy. In this process, China has agreed and announced to remove non-tariff barriers to international trade by signing the WTO Technical Barriers to Trade Agreement (TBT) and guaranteed full protection of Intellectual Property Rights (IPR) by signing the Trade Related Aspects of Intellectual Property Rights Agreement (TRIPS).

China's economic growth attracts international attention from foreign companies and governments interested in benefiting from China's growing economy, while worrying about China's restrictive policies. Over the last years since the accession time, problems concerning China's WTO membership transition problems and removal of trade restrictions have given way to new questions about non-tariff barriers and concerns over IPR protection in China. This study and report have also flourished from such a curiosity.

Views about the importance of technology standards for economic development have never been as stark as in the case of China. In fact, China has launched several initiatives to create home-made Chinese standards, some of which differ significantly from international standards. These initiatives are hardly novel from an industrial policy perspective, as other countries have also developed and used national standards to protect their national markets, tariffs and other protective measures aside. However, China's view of and reaction to the foreign patents incorporated in international standards as a

barrier to the development of developing countries, specifically of China's high technology sectors, diverge from this tradition.

China seeks to increase its relative gains from its participation in the global economy. To this end, the Chinese government has designed and pursued an ambitious national technology policy on a gigantic scale. This policy includes a set of policy instruments and strategies for domestic research and development, specifically to the benefit of Chinese companies in high technology sectors through the building of a Chinese intellectual property portfolio to incorporate into home-made Chinese standards. Hence, foreign governments and companies are concerned about the motives behind China's home-made standards initiatives, as the stakes in these policy initiatives are high for them (Suttmeier, Tan and Yao 2006, 1).

China's policy makers have continued to see international standards, particularly technology standards, as a barrier to their country's economic development, more importantly, as an offence to the country's national pride. This belief has been reinforced by the view that foreign companies have used international standards to force developing countries to deprive them of the ability to enter the international markets by forcing them to pay high royalty rates, due to the patents incorporated in these standards. Moreover, these standards, as they believe, have been created at international standards setting platforms dominated by multi-national companies and developed countries.

There are many cases verifying that other countries have also used their national standards as non-tariff barriers to the entry into their markets. Some of them have even successfully benefited from adoption of their national standards as international standards, by taking advantage of their control over the necessary technologies to dominate international markets and of required royalty payments.

Interestingly, the expectation was that China need to compensate for the benefits of WTO membership (market access, most favored nation status, etc.) by removing its protective trade regime and adhering to the international legal framework drawn by the WTO. However, instead of removing all its protection mechanisms which are incompatible with the international trade regime, China is reported to have sought to reform its policies by employing new strategies concerning IPR and standards in particular. According to Suttmeier, Yao and Tan (2006,1): "China has attempted to develop a new national standards strategy to reform the Chinese domestic standards regime and bring it into conformity with China's WTO obligations."

This report seeks to understand how and to what extent China has diverged from its well known policies of creating home-made Chinese standards and acquiring foreign technology after its entry into the WTO.

The thesis of this report is that China has not diverged significantly from developing home-made Chinese standards after the country's entry into the WTO, but Chinese authorities have adopted more flexible strategies to implement this policy. Accordingly, this report is about change in policy strategies. I argue that China has continued to enforce its own will upon foreign companies with a strong self-confidence stemming from its ability to negotiate on unequal terms with foreign companies, owing to its sheer market size. However incompatible these strategies with the principles of the WTO, China still plays the game with its own rules.

However, as explored in greater detail later, China's new strategies have been shaped by weak coordination and disagreements among government agencies and institutions. In so far as, it is not viable to talk about a well planned effort surrounding a policy or a strategy, despite the existence of clear lines.

To illustrate the potential explanatory power of this account, this report seeks to examine two important home-made standards initiatives; Wireless Authentication and Privacy Infrastructure (WAPI) and Audio Video Coding Standards (AVS).

WAPI has been the subject of an international dispute and wide scale scholarly interest. The United States Trade Commission brought the case to the international arena, and the case created tremendous tension between the US and China. Eventually, China retreated from using the standard as a mandatory standard binding for all the sectors. Therefore, many regard WAPI as a failure for China, even though China still insists on using the standard on a 'voluntary basis' by employing a different set of strategies.

While, the AVS initiative has emerged after China's entry into the WTO. The AVS working group and the patent pool have been highly admired by international observers for its openness and transparency

In its investigation report about the 'indigenous innovation policies' in China, the United States International Trade Commission (2010, 5-6) has described the role played by China's home-made standards efforts in this technology policy framework by categorizing the Chinese strategies in seven steps. According to this classification by the Commission; Chinese government begins with a Chinese high technology company with potential, in the second stage, the government brings in outside technical talent, often a Chinese American or a Chinese citizen working abroad, in the third stage of the process, the government uses public procurement and government purchases to favor the new product, allowing the company to build market share and acceptance of the brand, in the fourth stage home-made Chinese standards are introduced, agencies develop a standard that favors the new product, making it more difficult for foreign companies to compete in the Chinese market, in the fifth stage the government seeks approval of the new standard

from the International Organization for Standardization (ISO) or another international standards body when product gains acceptance in China, increasing its export potential, in the sixth stage government starts to fund at concessional rates or zero cost helping promote additional company growth, and lastly the government uses the anti-monopoly law to achieve technology transfer from foreign companies through enforcement of either (1) abuse of the dominance provisions or (2) compulsory licensing provisions of the Patent Law.

However, one of the conclusions of this study from the examination of the WAPI and AVS cases is that it is not feasible to explain and classify the Chinese strategies surrounding these cases with such a well planned approach. These strategies have continued to evolve through disagreements and negotiations between the Chinese government institutions within policy boundaries set by China's WTO membership and increasing international criticism. It is, nevertheless, clear that these strategies appear not to have been well planned but to be set into motion by policy makers continuing searches for best fit models and strategies.

In analyzing these cases, I have relied on available evidence provided by the review of the literature and English and Chinese news sources, as well as interviews conducted with some of the key people involved in the AVS initiative, some US business associations, experts on Chinese business law and an international law scholar. However, none of the companies in the AVS working group have accepted to be interviewed about the role played by the Chinese government in their entry to the working group and the patent pool, which might reflect their sense of uneasiness with the Chinese government.

This report is divided into six chapters. The second chapter analyzes the theoretical and historical background of China's policies of developing home-made

Chinese standards within the framework of 'indigenous innovation policies.' In trying to explain this background, I have first looked at the role played by technology, particularly compatibility, standards in countries' overall technology policies; secondly experiences of other East Asian countries, Japan, South Korea and Taiwan, from which China allegedly drew inspiration for its technology policies; thirdly the international law surrounding these cases and lastly history of 'Indigenous Innovation Policies.'

China's differences with other East Asian nations are as important as its similarities. China's technology practices and strategies concerning Chinese standards would clearly not work for South Korea's industry giants and Taiwan's small scale manufacturers due mostly to their small market size and dependence on international trade. On the other hand, Japan has previously tried, on many occasions, to promote discriminatory standards to protect distressed or strategically important industries. These efforts would eventually help prompt revisions to the GATT and the inclusion of the Technical Barriers to Trade provisions in the WTO regime. Moreover, Japan, for a long time, used its domestic market as a carrot to the foreign companies to extract foreign technology for its companies through joint ventures whose terms and conditions were checked and controlled strictly by the government. Japan also sets an example for China for the limits of government led national standardization efforts.

After establishing the theoretical and historical foundations of the analyses of the strategy change that I seek to configure, I proceed in Chapter three to examine the WAPI case in order to be able to properly to understand the background of China's changing policy strategies with the release of the 'Indigenous Innovation Policy Paper.' A major finding of this chapter is that; although, China has withdrawn from its preliminary policy position of imposing the WAPI standard mandatorily and confronting the multi-national

companies and their governments while trying to promote the standard at the international standards bodies, the country has started to implement a more delicate approach of promoting the standard in its domestic market through public procurement and government institutions and supporting coalitions with multi-national companies. For the Chinese policy makers, WTO membership does not present a cutting edge policy change, but rather it pawed the way for the evolution of Chinese policy strategies under new and more challenging constrains. For instance, the explanation that I develop to account for the change in attitudes in terms of transparency and openness in the WAPI initiative is that Chinese authorities have learned a lesson from their attempt to introduce a Chinese alternative to the DVD, the EVD that failed in the market in 2003.

An analysis of the WAPI case reveals that Chinese manufacturers are interested more in the additional transaction costs associated with use of a new standard which might not be accepted by the Global market, rather than the arguments of the Chinese government for the 'intolerable royalty rates' for the patents incorporated in the existing standards.

This chapter also discusses the legal implications of the WAPI initiative from an international perspective. The last section also looks at 'the Indigenous Innovation Policy Paper' and the policies which have gained momentum with the release of this policy paper. From the examination of the cases, it is viable to claim that the obstacles facing the Chinese standards in the post-WTO era for China and the restrictions of the membership would pave the way for China's Indigenous Innovation Policy Report and policies, with a multiple new strategies. It is also presumable to conclude that the drawback China lived in the WAPI case and other similar issues have played a decisive role in the developments leading to the release of this policy paper.

The fourth chapter examines the development of the AVS initiative and China's new strategies for promoting the standard, and discusses some of the changing patterns of China's technological policy strategies in this case. One of the important findings of this chapter is that companies' motivation for participation into the AVS working group and/or patent pool seems to have stemmed from their concern that their access to the Chinese market might be restricted for their non-compliance with this initiative. An analysis of this initiative implies that China has diverged from its early strategies and learned not to focus its efforts on a single standard and associated technologies which might fail in the market. And, similar to other standards initiatives in China, the Chinese government's support for and the adoption to the AVS standard are not smooth processes and on many occasions slowed by the lack of coordination and disputes among different government institutions or interest groups.

More importantly, even from casual observation of the sector in China, it is clear that the sector is hesitant about adapting to the AVS standard. This situation poses more questions about the success of the Chinese government in creating royalty free standards for the Chinese manufacturers. Chinese manufacturers seem to use both the Chinese AVS standard and internationally accepted standards at the same time through ensuring inter-operability.

This chapter concludes that despite the success of some of these strategies examined in this chapter, the overall achievements are limited with respect to various aspects of China's policy objectives.

The fifth chapter consists of comparison of the WAPI and AVS cases by configuring the main policy lines therein before proceeding to the chapter six. The critical finding of this chapter is that Chinese institutions have proved their organizational

capability to learn from their policy experiences. In this regard, to replace core foreign technology in critical infrastructure, the Chinese government benefit from a variety of tools, such as a foreign-focused anti-monopoly law, mandatory technology transfers, compulsory technology licensing, rigged Chinese standards and testing rules, local content requirements, mandates to reveal encryption codes, excessive disclosure for scientific permits and technology patents, discriminatory government procurement policies, and the continued failure to adequately protect intellectual property rights.

Most of the China's strategies are not novel; however, they are implemented within the new framework of the WTO and attract more international attention than other countries due to the size of the Chinese economy. From the examination of the WAPI and the AVS cases, it stands out that China focuses its efforts on getting the consent of foreign companies and ensuring their participation to stay away from a direct confrontation with foreign governments and disputes under the international trade law.

Chapter six interprets the observations and findings made in the previous chapters and concludes with a discussion of China's new policy strategies with respect to a WTO panel decision. The main finding of this chapter is that some of China's new strategies are probably still incompatible with the WTO rules and principles, and that China, instead, seeks to support coalitions among government institutions and foreign companies to prevent any trade dispute either at the WTO or with other countries. However, China's new strategies give the country the leverage to make it harder for the foreign stakeholders to prove that they violate the WTO rules.

Chapter 2: Theoretical and Historical Background

This chapter analyzes the theoretical and historical background of Chinese policies concerning China's home-made standards initiatives within the context of China's integration into the world economy. The first section of this chapter analyzes some important aspects of standards, particularly compatibility standards, for high technology companies and technology policies. Second part studies some of the key the national standardization and foreign technology acquisition policies of Japan, South Korea and Taiwan, three East Asian countries from which China arguably drew inspiration for its government led industrialization and economic growth model. The following section examines the WTO law surrounding the WAPI and AVS initiatives and China's WTO commitments. The last section examines the history of China's indigenous innovation polices and its implementation to provide the framework through which Chinese policy strategies change and evolve, as examined in these two cases in the following chapters. After establishing the theoretical and historical foundations of the analyses of the China's home-made standards initiatives, I proceed in chapter three to examine the WAPI case.

STANDARDS AS TECHNOLOGY POLICY TOOL

Standards have the capability to become an industrial policy tool for three basic reasons. First of all, many accept that standards expand markets by allowing compatibility through network effects, particularly in information and communication technologies. Greenstein and Stango (2007, 1) have defined technological standards as a cornerstone of the modern information economy and argued that: "these standards affect firm strategy, market performance and, by extension, economic growth."

Within the scope of this report, standards we investigate are compatibility standards which are generally critical for electronics, information and telecommunication industries. Throughout this report terms ‘standards,’ ‘technology standards’ and ‘compatibility standards’ are used interchangeably.

Compatibility standards define the interface requirements allowing different core products, often from different manufacturers, to use the same complementary goods and services, or be connected together in networks. Typically complements are other products, but they may also be services, such as maintenance networks, or direct networks of the same product, such as telephones or airline routes (Grindley 1995, 9). Compatibility standards are an essential prerequisite for much of the information technology sectors, including computing, software, networking, and telecommunications products. Products in these sectors derive much or all of their utility from the interoperability obtained by implementing compatibility standards (Joel 2007, 93).

Greenstein and Stango (2007, 8), for instance, have highlighted the rapidly globalizing role of information and telecommunication industries and the multinational manufacturers and telecom carriers operating at the global scale and competing for market dominance in a single national market and further in the global market. They have also argued that: “competition in these industries often means competition in establishing as a standard a particular technology that is favorable to its owner or supporters, and thereby the standard owner can dominate a market where the standard is widely and inevitably used.” In this context, standards not only help market growth by ensuring compatibility, but also give companies an opportunity to gain market advantage and dominance by establishing a dominant standard.

Moreover, Pelkmans and Beuer (Pelkmans and Rita 1987, 210) have also stressed the importance of standardization decisions in the presence of strong network externalities and large economies of scale as decisive determinants of competiveness: "Incompatibilities in the network, between networks as a whole and between different generations of a technology may lead to such costly adaptations that at the end enterprises may as a result of consumer preferences for compatibility for different products."

Many agree on that standards can help to grow the market size and bring sustained value to user and vendors and provide stability.

Acceptance of standards as de-facto standards by international markets or formally by international standard setting bodies might pose challenges for other countries which have not been a part of these standardization practices. As discussed in the next chapter, this trait of international standards setting process is the main pillar of China's criticism towards international standards. According to Shapiro and Varian (1998, 237): "Most standard setting takes place through formal standard-setting processes established by various standards bodies, never before have such cooperative, political processes been so important to market competition." Funk and Methe (2001) have recognized this trend that standards are increasingly decided by coalitions built around formal standard setting committees. They have also found that firms and governments have learned with experience gained with each generation of products. "European and Japanese coalitions of firms for the third generation [of mobile communication devices] were aimed at influencing the selection process of standard setting committees, which in turn affected the forecasted installed base. By understanding that committee actions can be effective means to jump-start the move in the market to the next generation, firms have attempted to pre-empt pure market based coalitions from having an effect" (20). Lee

and Oh (2008) have also shared this view by saying that: "decisions on standards design and implementation are not normally made on the basis of rational–logical process, but constructed through the constant realignment of interests among the actors involved."

In this framework, 'standards wars' as defined by Langlois (2007) between these interest groups, either companies or the governments that represent them, have become decisive for the success of new technologies. Through standards wars, "two new incompatible technologies struggle to become a de facto standard at various levels" (Shapiro and Varian 1998, 261). In addition, according to Grindley (1995, 31) standards wars would be a struggle for existence for firms as in many cases: "open standards are created by groups of firms united in competing against a proprietary standard to avoid being shut out of the market."

In standards wars between firms or consortium of firms acting together, countries' stand and policies attract considerable international attention. Cabral and Kretschmer (2007, 329-330) have highlighted the role of public policy in standards battles, given the importance of network industries. Countries may leave the decisive decisions concerning standards to the self-decision mechanisms of markets and firms, as well as decide on standards at a very early state. The high-definition television (HDTV) and mobile telecommunications are noteworthy cases in this respect.

Public policies have differed greatly between Europe and the US. Whereas, in many cases, the European Commission (EC) choose to focus primarily on early standardization, the US Federal Communications Commission (FCC) has adopted the more patient approach of letting market forces decide the winning standard (330).

Many observers of standards setting activities agree that alliances between industry and government are required for the development of de jure standards

(Backhouse, Hsu and Silva 2006, 420). Therefore, governments have a strong impact on the creation of global standards in the information and telecommunication industries (Funk and Methe 2001). Funk (1998) has provided an explanation for the role of governments in international standard setting, as firms benefit from their countries' national standards becoming global standards. Hence, they tend to collaborate with their governments, and solicit political support. International mobile telecommunications standards, for instance, have emerged through a hybrid process of committee and market mechanisms where firms and governments have collaborated (Lee and Oh 2008, 665).

More importantly, recently developing countries have also started to involve in international standard setting activities and try to create their own standards and promote them to the international arena. Lee and Oh (2008, 665) have argued, for instance, that:

Rapid development of technologies leading to an increasingly shorter life-cycle of ICT products is another factor which gives newcomers an opportunity to participate in standards setting in areas where products/services using the Standard are not mature enough for a de facto standard to emerge from market competition. In such cases anticipatory standards are developed and new comers can make their proposals for standards when there are innovation capabilities (Korea) or attractive market size (China).

Besides, the advantages of adoption of national standards as international standards from a single country perspective include license payments for the patents incorporated into international standards. In addition, vendor companies can use the patents to raise the cost to competitors, perhaps to prohibitive levels (Greenstein and Stango 2007, 101-102). For non-integrated firms that supply technology but not implementation, to have patents incorporated into the standards is a crucial part of

business models. Beyond patents, some potential implementers might have an interest in influencing the standard setting processes in a direction that will give them a competitive advantage in implementation. However, such situations and cases are rarely documented (105-106).

Mackie-Mason and Netz (2007, 240) have also shared a similar concern over designing royalty-bearing standards through which an interface specification consortium can harm component competition.

From the analyses of the compatibility standards and their IP related aspects, the overall impression is that the issues concerning standards might burden developing country companies trying to enter developed country markets without violating IP rights. In fact, this is exactly what Chinese policy makers have pointed out.

Yan (2007, 23) has attributed the rising interest of standard setting by the Chinese government to its strategic response to globalization and the global economy, where standards have become an important tool to leverage gains in international production networks. As, "the Chinese policy highlights the internal technology breakthrough through the efforts of China originated technology development, instead of borrowing imported technology from other countries, hence to improve the overall R&D level and lift its technology competency in global production network" (H. Yan 2007, 23-24).

The feeling that Chinese export manufacturing industry has to pay substantial royalties to foreign patent holders and that foreigners are reluctant to allow China to develop its own technological capacity has paved the way for the motivation for China's home-made standards in this respect. China sees international standards and patents hold by multi-national companies as means to deter developing countries from creating their own techno-industrial base. The DVD (Dissociated Vertical Deviation) players' IPR

dispute is worth mentioning here to exemplify this sense, where Chinese manufacturers pointed their fingers to the DVD patent alliances and consortiums for market distortion (Redfearn and Rouse 2009).

In this regard, what make China unique among other developing countries are its deliberately pursued policies towards creating its own home-made standards, to become a standard-settler country.

Technology	Chinese Standards	International Standards
Audio-visual Coding	AVS	MPEG2, MPEG4-3 (AAC), MPEG4-10 (H.264), VC-1
Digital Trunking	GoTa, GT800	TETRA, iDEN
Digital Video Players	EVD, HDV, HVD	Blu-ray, HD-DVD
Document Formatting	UOF	ODF, OOXML
Home Networking	IGRS, ITopHome	DLNA, UPnP, KNX, ECHONET
Mobile Phone Charger	YD/T1591-2006	None
Mobile TV	CMMB, T-MMB, CDMB, DMB-T, CMB	DVB-H, T-DMB, MediaFLO
Radio Frequency Identification (RFID)	NPC	ISO 18000 and others, EPC/GS1, uID
Security Computer Chip	TCM	TPM
Third-generation Cellular Telephony (3G)	TD-SCDMA	WCDMA, CDMA2000
Wireless Local Area Network	WAPI	Wi-Fi
Wireless Metro Area Network	McWILL	WiMAX

Table 1: Major Chinese Standards Initiatives (Kennedy, Suttmeier and Su 2008).

According to Lee and Oh (2008, 665), two factors are apparently responsible for this new phenomenon. First, the technological capabilities of China, as a fast growing country, have become sophisticated enough to encourage the government to develop their own standards. And, the technology gap between China and other developed nations have narrowed. These two factors enable China as a new comer to encroach into the competition for international standards.

The next section summarizes some of the key cases from other East Asian countries' experiences with home-made standards initiatives and foreign technology acquisition strategies. This chapter serves to help better understand the background of China's policies.

OTHER EAST ASIAN COUNTRIES

According to a World Bank report, Government intervention has played a positive role in promoting economic growth in high growth economies of East Asia (World Bank 1993) and in these countries, government intervention took several forms, from exchange rate management to picking winners (Linden 2003, 1). China has used several policies to catch up with world's technology leaders, particularly in telecommunication and electronics sectors (3). In fact, many believe that electronics sector has been a major contributor to growth in East Asia (Ernst and David 1992). Apparently, China has drawn inspiration from and sometimes followed the footsteps of other East Asian nations in the industrial and technology policy field.

However, Chinese policies differ from other East Asian nations to the extent that is defined by three factors; existence of foreign companies in China's large domestic market which has led to international pressure, China's WTO membership to gain preferential treatment, and the bargaining power of the country stemming from its large market. Keister (1998) has contended that China's large market allows it to have the strengths of different models without necessarily weaknesses.

For instance, a United States – China Economic Security Review Commission report has made the following observation:

Chinese industrial policy shares with the industrial policy experiences of other East Asian countries in having both successes and failures. The successes, often achieved

at great - and in some cases, arguably, unnecessary - costs have come as a part of the national "catch up" strategies that have transformed poor agricultural countries in the region into the ranks of technologically capable, middle-or wealthy country status. The ability to mobilize resources and direct them towards state selected priority sectors has been the key to this catch-up strategy. (U.S. - China Economic and Security Review Commission 2009, 132)

Nevertheless, China's differences with other industrialized nations are as important as its similarities in this regard. In comparing other East Asian countries where foreign direct investment stocks compromise a significant share of their economies with China, Chinese uniqueness can be apprehended. Such practices and strategies would clearly not work for South Korea‘s industry giants and Taiwan‘s small scale manufacturers due mostly to their small market size and dependence on international trade.

When comparing China with Japan, Kennedy (2006) has observed that Japan preferred to license technology rather than allow foreign investment and joint ventures. In 2000, the stock of foreign direct investment accounted for 17.9% of China‘s GDP; the comparable figure for Japan was a only 1.1%.55. As a result, there has been less internal opposition within and outside Japan to a variety of non-tariff barriers among other things, including discriminatory standards (60).

These differences between the size and features of economies provide an explanation to understand the differences in their strategies and the motivations behind them.

Japan

Japan has been one of the most notorious countries in terms of protecting its domestic market with non-tariff measures, including national standards and burdensome conformity assessment procedures. However, many believe that the country has failed in promoting its national standards as internationally standards.

Japan's use of national standards as a non-tariff barrier to international trade is widely publicized. Japan is not alone for pursuing such policies. Many countries have attempted to use standards as a policy tool to protect their domestic market and as a means to favor domestic producers in ways that capture national advantage from participation in the global economy. Japan has previously tried, on many occasions, to promote discriminatory standards to protect distressed or strategically important industries. These efforts would help prompt revisions to the GATT and the inclusion of the Technical Barriers to Trade provisions in the WTO regime (McIntyre 1997, 146).

Stern (1997, 80) has also explained Japan's motivation for using standards that attempt to replace foreign technology or burden foreign competitors with the country's goals to reduce business risk to its companies. In 1984, American PBX makers, for instance, complained that secret standards for voice quality, based upon a mechanical ear that existed only in Tokyo and Geneva, would create a barrier to their operations in Japan. In another well known case, American computer peripheral companies complained about a proposed Japanese standard for interruptible power supplies that would act as drag on American gains in market share.

History of the US and Japan trade relations has provided us with so many similar cases exemplifying Japanese policies (Woodal 1997, 147). "Numerous complaints from these cases have alleged that Japanese standards serve to protect the interests of cartelized

industries or well-entrenched primary producer lobbies. Although, these 'protective standards' are often justified on economic grounds, for instance employment for declining industries, most of the time their true rationale is political (153-154)."

Moreover, public procurement has also been restrained to products which are in conformity with Japanese national standards and carry the mark for Japanese standards (Gabel 1987, 32). In so far as, the Industrial Standard Law required all the government institutions to purchase goods conforming to the Japanese national standards and carried the JIS (Japanese Industrial Standard) mark, if such goods were available. Only goods produced in Japan, however, could be tested and certified to conform to a JIS standard and carry the JIS mark. Even goods produced by Japanese owned firms overseas could not bear the JIS mark. Consequently, the government institutions were prevented by law from purchasing foreign goods if equivalent Japanese goods were available and carried the JIS mark.

The success of these protective policies might have stemmed from the lack of interest from foreign companies in Japan's domestic market. According to Mclntyre (1997, 158): "as long as foreign firms, particularly American companies, displayed little interest in penetrating in the Japanese market, it was relatively easy to employ standards that rigged domestic markets to favor selected firms and prohibited foreign competitors from snatching a significant market share in strategic industries and sectors."

However, Japan faced strong reactions in the international arena for its efforts to protect its domestic market through non-tariff barriers to trade, particularly national standards. During the Tokyo Round of the General Agreement on Tariffs and Trade (GATT) negotiations in the mid 1970s, standards and national standards systems (non-tariff barriers to trade) were highlighted as a major form of non-tariff barrier to trade. The

standards system in Japan came under harsh criticism as a major non-tariff barrier, particularly the relationship of Japanese standards specifications to standards, and the conformity assessment procedures for foreign products. In the 1980s' certain Japanese standards started to be seen as none of the key examples of the devices by which the Japanese government and industry act to close the economy to foreign products (Lecraw 1987, 29-30).

Japan has not limited the use of standards as a non-tariff barrier to trade to protect its domestic market, but it has also sought to establish international standards in high technology sectors. These two policy goals have tended to go hand in hand. As examined in the following chapters, China is not the inventor or the forerunner of these strategies in East Asia.

High Definition Television (HDTV)

In the early 1970s, the Japan Broadcasting Corporation (NHK) started a research on a studio standard of High Definition Television (HDTV). Besides this production and studio standard, NHK demonstrated a transmission system called MUSE. Japanese producers were also reported to conduct extensive research on set production. The arguments for and aim of the HDTV are significant improvement of picture quality, the establishment of a new service genre, instead of an enhanced TV system and the creation of software for the 21st century (Beuer and Pelkmans 1987, 200). The true motives, however, according to Beuer and Pelkmans (1987, 200) may well be strategic: "Conversion between HDTV/60 Hz and HDTV/50 Hz would not be desirable to NHK as it would imply more than one HDTV studio standard and a deterioration of the picture quality. In comparing the MUSE system with MAC, the NHK reached the contestable conclusion that MUSE shows better results for both still and moving pictures." The

Japanese seem to have used a liberal but carefully planned patent and licensing policy (203).

The Japanese planners were behind the scene for the HDTV standard initiative in every stage of the process. Grindley (1995, 195) has stressed the importance of the powerful strategy planned and followed by the Japanese developers for the global dominance of the HDTV market; they first established a domestic consensus between manufacturers and the state broadcaster, and introduced the global standard in stages for program production then transmission.

The project was coordinated by the Japanese Ministry of International Trade and Industry (MITI). They worked to ensure consensus between manufacturers, supported basic research and ensured that bank funding was available. The NHK developed the standard and the basic circuitry, and manufacturers such as Sony began developing compatible products. The basic NHK patents were made openly available to the sector. The system was demonstrated in Japan in 1980 and in the US in 1981. More importantly, in 1988, during the Seoul Olympic Games, live public demonstrations of satellite transmissions were made across Japan. The Japanese planned to benefit from the sale of the electronic products which are compatible with the standard, as the key patents were likely to be on the equipment developed by the manufacturers around the standard, and these are unlikely to be freely accessible (Grindley 1995, 203).

However, this strategy would fail against the US standard which was the outcome of an unusual standard setting procedure, combining market and official processes. According to Grindley (1995, 195), eventually American policy would lead to an advanced digital system to become the global standard: “The Japanese strategies came near to success in introducing Hi-Vision standard, and probably would have succeeded

had the technical and economic performance of the system been more favorable." Grindley (1995, 195) has also attributed the failure of the Japanese standard to premature standardization through concentration on the mechanics of consensus, at the expense of allowing market demand to express itself. The Japanese strategy was effective in deciding a standard, but was not fully in touch with demand, and even in Japan the system has been regarded as outmoded and expensive. In addition, the consensus was too nationally oriented (196-197).

Failure of the Japanese developers to develop a global HDTV standard also shows the limits of government led national standardization efforts. Japan seems not to have given serious thought to the demands of the consumers in development of the standard. Despite the powerful coalition building strategies of the Japanese, the US's market driven approach has proved itself as a reliable strategy to establish global standards in this case.

Grindley (1995, 196-197) has argued that the centrally orchestrated policies in Japan and Europe may have been less effective than the hybrid policy used in the US, combining market and official processes. The Japanese model of administrated guidance effectively ensured consensus but they chose a conventional and apparently low risk technology, unappealing to users, although many elements of the Japanese strategy are valid. They, for instance, have established de facto standards for studio equipment, to succeed in a major share of the consumer market whatever transmission standard is chosen.

Video Home System (VHS)

In contrast to Japan's failure with the HDTV standard, Japan has witnessed another significant Japanese standard initiative exemplified by the competition between Betamax and VHS systems. This time, the Japanese planners at the MITI let Sony and

Japan Victor Corporation (JVC) compete for the market dominance of their standards. However, in 1976, they both lobbied the MITI to acquire government support, especially for export markets. Initially, the MITI supported Betamax, as it was the first standard that had been presented to the public and they did not want to confuse the market. However, as a result of the arguments of JVC and other manufacturers' support, including Matsushita, for the VHS, MITI decided to accept both standards and left the market to sort out the contest. Although, Sony's Betamax system has been generally accepted to be technically superior to the Betamax (Grindley 1995, 75), JVC conquered the market with its 'educational' marketing strategy. Its market share in Japan rose from 40 per cent in 1977, to 67 per cent in 1980, and to 93 percent in 1987. Acceptance of the VHS standard across the world would bring down product prices, most visibly in the US (84).

Foreign Technology Acquisition

In comparing China with Japan in foreign technology acquiring policies, Japan stands out to have preferred licensing foreign technology rather than allowing foreign investment (Kennedy, The Political Economy of Standards Coalitions: Explaining China's Involvement in High-Tech Standards Wars 2006, 60). In addition, the MITI involved actively in negotiations between Japanese and foreign companies to reduce the licensing costs for Japanese companies. Japan's preference for licensing foreign technology may have stemmed from Japan's growing interest in foreign markets where Japanese firms may face patent infringement law suits and the fact that Japanese government lacked negotiation advantage vis-à-vis foreign companies due to their insignificant involvement in the Japanese market.

However, Japan, for a long time, used its domestic market as a carrot to the foreign companies to extract foreign technology for its companies through joint ventures

whose terms and conditions were checked and controlled by the MITI. In comparing Japan with China in terms of their market size, University of Texas at Austin Professor Kenneth Flamm (pers. comm., 2/08/2011) highlighted the attractiveness of the large Japanese market, which is almost half of the US economy, for foreign companies.

Besides being an important tool as a non-tariff protective measure, another important historical motivation for Japan's home-made standards is that Japan has also used these standards initiatives as one of the methods it has employed to acquire and disseminate foreign technology.

The role played by the MITI for entry of foreign technologies in Japan stands out as another key factor in Japan's strategic technology acquisition policies. Beginning in 1950, MITI was given authority to approve or reject all contracts for technology with foreign companies, owing largely to the scarcity of foreign exchange by Japan. With its control over approval of direct investment in Japan by foreign companies and a licensing system for imports, MITI controlled the terms on which Japanese electronics companies could acquire foreign technology. Most noteworthy, compared to China's recent strategies of market access for technology transfer as examined in the next chapters, is the MITI's efforts to force foreign companies to transfer or license their technologies to Japanese enterprises in exchange for market access (Flamm 1995, 44).

MITI exercised tight controls over licensing, royalty, and technology transfer agreements, to influence the pricing and composition of technology imports and the structure of high-technology industries in Japan (55). MITI would allow only a limited number of foreign companies to invest in Japan, only through joint ventures with Japanese partners and in exchange for technology transfer. For instance, through 1963

only seven foreign semiconductor producers had been permitted to invest in the Japanese market, in all the cases extensive transfer of technology was a part of the deal (57).

In addition, Japanese planners in MITI tended to closely monitor the deals between Japanese and foreign companies and allowed restricted market access only in exchange for extensive technology transfer to Japanese producers. MITI orchestrated, for instance, the negotiations behind the scenes between Sony and Texas Instruments. According to the agreement, Texas Instruments would only be allowed to enter the Japanese market, only in exchange for accepting a 3.5 per cent royalty rate for all the Japanese semiconductor makers for its patents, under continuing pressure from MITI (70). And, again, in the early 1960s, and again in the late 1960s and early 1970s, initially successful attempts by foreign chip producers to enter the Japanese market were blocked and parried by the government at the request of the domestic industry (124).

South Korea

In East Asia, South Korea has been one of the few industrialized countries that try to develop its home-made standards. The South Korean Government has launched an initiative to create a home-made standard for Code Division Multiple Access (CDMA) technologies for the economy with close corporation with these companies. In fact, the government played an important role in the development and commercialization of CDMA technologies by working closely and neutrally with all industry partners. In 1993, the government set up a research fund for the development and implementation of CDMA technologies. It was financed from the funds obtained from the license fees of five CDMA operators and managed by the Institute of Information Technology Assessment whose board consists mainly of executives from operators. The government also arranged collaboration among government institutions and manufacturers from the

beginning to minimize the time lag between the technology development and commercialization. Five Korean companies, Samsung Electronics, LG Electronics, Hyundai Electronics and Maxon, along with KT and ETRI established a research consortium, in collaboration with Qualcomm to develop, design, implement and field-test main components of the network infrastructure and terminals in 1989. However, for the South Korean companies and ETRI, Qualcomm provided an opportunity to gain access to mobile technology. Meanwhile, foreign manufacturers did not participate in this consortium because they primarily focused on the growing GSM market in Europe and the East Asia and worked on the next phase of services for the US (Lyytinen, Yang and Yoo 2005, 337).

The limited numbers of major companies dominating the domestic market and operating in the South Korean economy, which also have close ties with the government, seem to have helped South Korea in its efforts to launch and develop this standard initiative. In addition, the main goal of the South Korean policy makers appear to create a royalty free technology environment for the South Korean companies rather than establishing a global standard and benefiting from it. Given the size of the South Korean economy, this policy is understandable.

Taiwan

Taiwan provides an example to the Chinese policy makers for foreign technology acquirement and dissemination. However, Taiwan has not launched any home-made standard initiative, owing probably to the small size of its economy. Taiwan, however, has showed distinct policies and strategies to acquire foreign technology.

According to Dadgson, Kastelle and Mathews (2006, 92), research consortiums have emerged as an innovative form of research and development collaboration in East

Asia, particularly in Taiwan. The role of research consortiums which function as patent pools continues to evolve in Taiwan.

Government supported technological and scientific research institutes acting as innovation intermediaries have been indispensable in Taiwan's industrial development based on high technology. For instance, the Taiwan New Personal Computer (TNPC) Alliance formed in 1993, as of 2006, involved 31 partners including IBM, Apple and Motorola (91). According to an article of Mathews and Poon, which was published in the 74(6) issue of the Journal of Industry of Free China in 2005 (cited in Dadgson, Kastelle and Mathews 2006, 91), the alliance has brought together companies from all branches of the information technology industry with a clear focus on transferring, up-taking and diffusing the new PowerPC technology in a series of products spanning PCs, software, peripherals and applications such as multimedia. This consortium seems also to have played an important role in negotiations with the American partner company and the diffusion of the foreign technology.

In addition, it is noteworthy that Taiwanese government has closely scrutinized license agreements between Taiwanese and foreign companies, and it has not hesitated to intervene in these deals within the framework of its IPR strategies. For instance, in the late 1990s, Philips licensed its pooled patents in a set package to Taiwanese CD manufacturers. One of the major Taiwanese companies, Gigastorage and other Taiwanese manufactures stopped paying royalties to Philips in 1999 and filed a complaint with Taiwan's Fair Trade Commission (TFTC) against Philips, Sony and Taiyo Yuden. The Taiwanese CD manufactures alleged that: "the patentees violated the Fair Trade Act because through their patent pool they had a monopoly on the CD-R market, abused that

monopoly power by demanding allegedly excessive royalties, colluded with each other to set prices, and tied non-essential patents to essential patents" (Lim 2006).

The TFTC ordered the patentees to allow prospective licensees the option of licensing individual patents rather than a package of patents and imposed fines totaling about NT$14 million (US$437,000). In addition, on appeal of Philips, the Taiwan Higher Court concluded that: "the patentees had improperly used their monopoly power on CD-R technology to fix prices. In addition, the patentees abused their monopoly power by requiring licensees to withdraw any challenges to the validity of the patents to be licensed." While the cases regarding an alleged violation of Taiwan's Fair Trade Act were pending, Taiwan's Intellectual Property Office concluded, in response to Gigastorage application for a compulsory license for Philip's patents that: "while Philips had committed unfair competition, its basis for issuing a compulsory license was not based upon that violation. Instead, the basis for the grant was that Gigastorage met the Taiwanese Patent Law's requirement that it could not reach an agreement with Philips for reasonable commercial terms and conditions after a considerable time period" (Lim 2006).

In addition, the Flat Panel Display (FPD) industry is another example of government led research and development collaboration efforts in Taiwan. In the 1990s, as the Industrial Technology Research Institute (ITRI) sponsored various research programs in TFT–LCD technology, the institute acquired several patents to pave the way for Taiwanese firms' entry into this high technology industry. However, when Taiwanese firms entered the industry, they allegedly faced 'patent attacks' from established firms, demanding royalties for patent infringements. At this critical moment, ITRI formed the Taiwan TFT–LCD Association (TTLA) and transferred 232 patents to the association, to

provide a collective defense in the event of patent attack. The Association compromised of six Taiwanese firms; AU Optronics, Chi Mei Optoelectronics, Chung Hwa Picture Tubes, Hannstar Display, Quanta Display, Toppoly Optoelectronics, Prime View International and ERSO. TTLA was basically a patent pool and was modeled on the MPEG Association which licenses streaming video technology (Dadgson, Kastelle and Mathews 2006, 92).

From the observation of these alliances, the overall inference is that the main purpose of the Taiwanese industry alliances appears to be negotiating with foreign, particularly the US technology companies as a single consortium instead of separate companies to license foreign technologies at reasonable costs and eliminate barriers to their entry into international markets.

INTERNATIONAL LAW

In analyzing the transformation of China's strategies for the promotion of Chinese standards through the Indigenous Innovation Policies, it is clear that it is the international reactions and pressures that have directed some of China's strategies and retreats. But, one key element that needs to be taken into account when studying Chinese standards initiatives is the international law underlying these cases within the scope of China's WTO membership. But, which international agreements concern China most in its strategy change?

According to Qingjiang (2009, 752), two international events have been a rude awakening for China. First one is the Uruguay Round which included IPR for the first time in the history of the multilateral trading system. The second is the United States' forceful and constant exertion of pressure on China to institutionalize an IPR regime of a

higher standard of protection. These two events have highlighted the importance of IPR in the eyes of China.

WTO membership opened a new era for China. Even before its WTO membership, enforcement of counter measures by the US against China's international trade practices or weak IP protection regime, under the Article 301 provisions of the US law apparently convinced China of the need for an international framework for legitimacy of its actions. In fact, China's 301 journey began in 1991 when it was declared to be a 'Priority Foreign Country' by the US government. Failures in providing adequate and patent copyright protection for US products in its market, especially for computer software programs, were listed as the reasons for putting China in this list (Dinwoodie, et al. 2008, 711).

In January 1995, the WTO was built upon the legacy of GATT. With the establishment of the WTO, countries have found a new platform to discuss and negotiate over non-tariff barriers and IPR disputes. Non-tariff barriers are called 'the crucial terrain of trade policy today,' becoming 'significantly more important' as the old line trade barriers of tariffs and quotas have been substantially reduced under more than four decades of the GATT regime (Gibson, Paper 43 2007, 47-49).

The TBT Agreement

In analyzing Chinese standards initiatives, one important international trade agreement that needs to be taken into account is the TBT Agreement. It has a special place to understand the trade regime through which China has sought its way for its standards initiatives.

Although, the WTO incorporates a package of multilateral agreements which respond to the increasingly complex devices, such as non-tariff barriers, that can be used

to protect domestic interests and inhibit competition from imports, the non-tariff barriers to international trade had already came into the fore during the Tokyo Round of GATT negotiations in 1970s.

Gibson (2007, 47-49) has summarized the history of international negotiations over non-tariff barriers before the enactment of the TBT Agreement as follows:

The negotiations for reducing NTBs were complex, and the Round resulted in nine different special agreements on non-tariff measures, which were called "codes" because they involved reasonably concrete obligations. Among these limited membership codes, the Agreement on Technical Barriers to Trade, signed in April 1979 (the "Standards Code"), proved to be one of the most successful, with 47 governments eventually signing it (more than any other code).

The TBT Agreement has emerged from the Uruguay Round. Unlike its predecessor the Standards Code for non-tariff barriers, it is fully integrated into the WTO system, as its provisions are binding for all the WTO members and any infringement of these rules would be governed by the WTO's dispute settlement mechanism. The broad purposes of the TBT Agreement are set forth in its preamble; encouraging international standards and conformity assessment systems, to improve the efficiency of production and facilitate the conduct of international trade, and ensuring that technical regulations, standards and procedures for assessment of conformity with technical regulations and standards do not create unnecessary obstacles to international trade (Gibson, Paper 43 2007, 47-49).

However, the TBT Agreement does not have any provision addressing the IPR incorporated in international standards.

The TRIPS Agreement

On the other hand, in analyzing Chinese initiatives, the other important international trade agreement that needs to be taken into account is the TRIPS Agreement. The Uruguay Round negotiations would be extended and ultimately led to the conclusion of the TRIPS Agreement in 1995. According to some observers the new agreement has given the developed countries what they had sought from developing countries with regard to IPR. This agreement indicates that the international patent law and policy have become ever more important in global economic development (Dinwoodie, et al. 2008, 446-447).

The Fourth Ministerial Conference of the WTO which was held in Doha, Qatar, in November 2001. This conference became known as the 'Doha Development Agenda' as expressed in the Doha Ministerial Declaration. That separate declaration seems to have provided developing countries a legal basis to overcome the rigidity of the international IPR regime. For our purposes in this study, Paragraph 37 of this declaration is significant:

We agree to an examination, in a Working Group under the auspices of the General Council, of the relationship between trade and transfer of technology, and of any possible recommendations on steps that might be taken within the mandate of the WTO to increase flows of technology to developing countries. The General Council shall report to the Fifth Session of the Ministerial Conference on progress in the examination. (World Trade Organization 2001)

That separate declaration has called upon the members to examine ways to liberalize the compulsory licensing provisions of Article 31 the TRIPS Agreement. Two years later, the decision of the WTO General Council at the Fifth Ministerial Conference

in Cancun in 2003 would also implement changes in Article 31(f) of the TRIPS Agreement on an interim basis (Dinwoodie, et al. 2008, 446-447).

China's WTO Commitments

TWTO members formally approved China's accession to the WTO in November 2001 and China became the WTO's 143rd member on December 11, 2001. Prior to China's accession to the WTO, China and other WTO members negotiated bilaterally concerning China's market access commitments and concessions. In addition, the WTO Working Group Party (composed of all WTO members) engaged in multilateral negotiations with China concerning the rules that would govern trade with China. These commitments are set forth in China's Protocol of Accession and in an accompanying Report of the Working Party (Working Party Report). It is noteworthy that the Working Party Report has a number of the key commitments by China concerning Chinese standards. According to the record of this report, delegates from member countries raised questions about the opportunity for public consultation and commented on proposed Chinese standards, technical regulations and conformity assessment procedures (Gibson, Paper 43 2007, 51).

China agreed and confirmed, upon accession; to amend its procedures to clearly indicate minimum time frames for allowing public comment and to let comments be given due consideration regardless of origin; to accept the TBT Agreement's Code of Good Practice; to follow a clear policy to periodically review existing standards to harmonize them with relevant international standards where appropriate, and to bring all technical regulations, standards, and conformity assessment procedures into conformity with the TBT Agreement (51-52).

China also pledged to give up the system of separate safety certification standards for domestic and imported products (the 'Great Wall' and 'CCIB' marks, respectively) in favor of the new unified 'CCC' standard. It also agreed to reorganize and merge its standards bureaucracy (Suttmeier and Xiangkui 2004, 24-25).

As regards China's standards initiatives and the rhetoric surrounding them, a review of the final accession protocol suggests that China does not have specific responsibilities to use international standards, but only that China will comply with the TBT Agreement. The Protocol is also silent on whether China is entitled to recourse as a developing country (Gibson, Paper 43 2007, 53). However, many member countries have expected China to try to harmonize its national standards with international standards. As of 2006, China had 21,342 national standards, 9,381 were either international standards adopted as national standards or were derived from international standards, including 4,917 ISO standards and 1,902 from the International Electrotechnical Commission (IEC) (Suttmeier, Tan and Yao 2006, 11).

During negotiations, the Chinese representative reportedly said that:

China's active adoption of international standards as the basis for technical regulations was a basic policy for accelerating its industrial modernization and promoting economic growth… To eliminate unnecessary barriers to trade, China would not maintain multiple or duplicative conformity assessment procedures, nor would it impose requirements exclusively on imported products. (quoted in Gibson, Paper 43 2007, 51-53)

In addition, in the accession protocol, China has made the following statement:

China shall apply and administer in a uniform, impartial and reasonable manner all its laws, regulations and other measures of the central government as well as local

regulations, rules and other measures issued or applied at the sub-national level (collectively referred to as "laws, regulations and other measures") pertaining to or affecting trade in goods, services, trade-related aspects of intellectual property rights ("TRIPS") or the control of foreign exchange. (Dinwoodie, et al. 2008, 726)

In addition, a report by the U.S. - China Business Council (2010, 16) has verified that China has also agreed to accord national treatment for testing and certification bodies by opening technical testing and analysis services to foreign service providers that meet specific administrative, capital, and other requirements, and promised to permit qualified foreign companies to establish wholly foreign-owned subsidiaries by 2005. According to the same report, however, foreign companies in this field continue to face barriers to certifying products for sale in China. And, standards and conformity assessment have remained as a key concern for many foreign companies. Many of the council's member companies report limits on their ability to participate adequately in China's standards and conformity and conformity assessment system, with just 20 per cent of respondents describe their ability to participate as 'good.'

HISTORY OF INDIGENOUS INNOVATION POLICIES IN CHINA

This section examines the history of events and policies surrounding the Indigenous Innovation Policy Paper which was officially released in 2006. The indigenous innovation policies were launched after China's WTO membership and reflect the change in the Chinese strategies and trends in technology and innovation policies. To provide a more thorough historical account of the examined cases, this policy paper is discussed in the following chapter about the WAPI.

China's statist ideological legacy from the cold war era under the influence of the Soviets seems to have played an important role in the formation of China's attitude

towards technological sufficiency for China. From the very beginning, the main goal of the Chinese technology policies was to acquire foreign technology either through Soviets or Western countries in an effort for self-sufficiency in defense and rapid industrial growth in strategic technologies.

In this era, Chinese Academy of Science (CAS) was reorganized in the model of the Soviet Academy of Science. The Soviet Union sent over 11,000 scientists and technicians to China, while China sent nearly 40,000 students to the Soviet Union. The Soviets also provided substantial technology transfer to Chinese science and research institutions, while Chinese Communist Party (CCP) bureaucrats took charge of all them.

The Chinese government focused also its efforts on mega projects to create an industrialized economy as fast as possible. In 1956, the first national science and technology plan was developed by the CAS, with Soviet oversight. The 12 year plan listed 582 research projects, including 'the two bombs and a satellite plan' that laid the groundwork for China's 1964 atomic bomb, 1967 hydrogen bomb and 1970 'East is Red' satellite. It is also noteworthy that, in all these projects the US educated Chinese scientists were key contributors. Chinese scientists, who returned from the US, after 1949 to build the new China, or escaped McCarthyism in the US, were key players in the science and technology accomplishments of the era (Macgregor, China's Drive for Indigenous Innovation' - A Web of Industrial Policies. n.d., 8).

A review of the history of Chinese science and technology policies suggests that the roots of the Chinese mentality about the country's need to acquire or develop vital technologies for national sovereignty lay in this period. Richard P. Suttmeier has argued from his comparative analysis of the Chinese and Japanese electronics industries over a 40 year period that: "many of the Chinese advances occurred in almost exclusively

military and strategic programs. These programs showed no economically beneficial diffusion into nonstrategic or civilian arenas and actually hindered the industry's wider development" (Goth 2005, 85).

The ideological emphasis on technology as the key to China's national sovereignty has continued even after the opening of the country to the global economy in 1978. This new era has witnessed changes in Chinese technology policies without necessarily changing the mainstream policy objectives. In March 1978, the State Science Commission organized the National Science Conference with 6, 000 delegates, to draft a new plan for China's science policy to serve as a driver for China. This plan was developed by almost 20,000 experts from different fields, focusing on 27 research areas and 108 key research projects. Eight large projects were also in the plan in the fields of agriculture, energy, materials, electronic computers, lasers, space science, high-energy physics and genetic engineering (Macgregor, China's Drive for Indigenous Innovation' - A Web of Industrial Policies. n.d., 8).

Since the day Deng Xiaoping unveiled science and technology as one of China's 'Four Modernizations' science policy has been in the direct hands of the country's top leaders, far beyond anywhere else in the world. Formal responsibility was placed in the premier's hands in 1983 with the creation of a 'leading group' for science and technology, a structure the Party employs for its most crucial initiatives. Throughout the 1980s and early 1990s, science and technology system reforms and new programs went into fast-forward. At the same time, Chinese diplomats scrambled around the world signing S&T cooperation agreements with nearly 100 countries. Thousands of Chinese scientists took up posts in nearly every major international science organization.

(Macgregor, China‘s Drive for Indigenous Innovation‘ - A Web of Industrial Policies. n.d., 8)

According to Suttmeier and Xiangkui (2004, 13), the new Chinese technology policy strategies have involved a series of measures to exploit resources available from the international environment including; sending of large numbers of students and scholars abroad for advanced training, the purchase of vast amounts of foreign technology, the development of a foreign investment regime intended to acquire technology from by foreign firms operating in China, the use of financial and consulting services from abroad, and the signing of a large number of agreements with foreign governments for scientific and technological cooperation.

They have also concluded from their study that the Chinese government’s interactions with the international community afforded the policy makers numerous opportunities for learning, not only about technology, but also about policies, institutional designs, and managerial practices to reform the Chinese innovation system. “These opportunities were seized by Chinese policy makers and policy analysts, both to benchmark China’s progress and to graft successful foreign practices on to Chinese realities” (Suttmeier and Xiangkui 2004, 13).

On the other hand, during the opening of the Chinese economy, patent rights have been strengthened. Before 1985, China only had a Management System of Science and Technology outcome, which presumably belonged to the entire country. According to China’s first Patent Law, individuals could not apply for patents for inventions relating to their jobs, using materials from work, or within one year of leaving that job. Furthermore, without the permission of the government, government enterprises could not file patent

applications autonomously. Despite the reform of the system, however, for a long time, some sectors have been excluded from patent protection (Liang and Xue 2010, 475).

According to Liang and Xue (2010, 475), the pattern of the development of IP rights reflects the Chinese authorities' intention to balance between stimulating indigenous innovations and attracting foreign technology by enforcement of patent protection.

As a matter of fact, one important factor that paved the way for the release of the Indigenous Innovation Policy Paper in 2006 is China's efforts to develop the electronic sector and the dependence on foreign companies for IPR to support this critical sector. The SVCD (Super VCD) and EVD (Enhanced Versatile Disc) standards initiatives to replace CVD (China Video Disc) and DVD technologies respectively, by the Chinese policy makers are worth mentioning in this sense. In fact, in a number of industries, including electronics, Chinese firms were complaining about paying substantial license fees for the foreign technology, forcing Chinese producers to operate on thin profit margins. However, "the Japanese suppliers of knowhow and components, in comparison, are able to enjoy considerably larger margins by virtue of their control over the IP and standards" (Suttmeier, Tan and Yao 2006, 10-11).

In a noteworthy case, in September 1997, China's Ministry of Electronics Industry (MEI) announced its plans for Chinese extensions to the VideoCD 2.0 standard that would add internet connectivity and other interactive features. The three leading suppliers to the market were all US-based; C-Cube Microsystems (which claimed almost 70% of the market in 1997), ESS Technology, and Oak Technology. According to Linden (2003, 7), these companies were central to the effort to launch an updated standard, as holders of essential technologies. In cooperation with these corporations, the Chinese government

launched a home-made standard initiative to develop a Chinese standard that would differ significantly from internationally accepted standards. The primary goal was apparently to acquire intellectual property that could be used to reduce royalty payments either directly or through use as a bargaining chip in royalty negotiations. A secondary goal may have been to favor Chinese companies over foreign competitors through the use of Chinese standards a non-tariff barrier. The Chinese government began collecting and pooling patents from its own agencies, foreign and domestic companies, universities and research institutes to incorporate necessary IP into the Chinese standards. Low profit margins in the electronic sector seem to have been the critical factor behind this initiative:

While the government-sponsored standard was still under development, a competing VCD standard was floated by C-Cube Microsystems, backed by a coalition of Chinese VCD assemblers. CVD (for; China Video Disc), The field got even more crowded with a competing proposal, HQ-VCD, from the primary VCD patent holders and a fourth option from MEI's own working group. In June 1998, the Ministry of Information Industry (MII, a super-ministry which had absorbed MEI) held an industry meeting to settle on a format, with the various proposals under consideration differing mainly in how close their screen resolution would come to the ultimate rival technology, DVD. At the time of the meeting, DVD component suppliers were rounding up support for the format among Chinese electronics producers, but DVD players would cost more than twice as much as VCD players – a high barrier in the price-conscious mainland market. (Linden 2003, 8)

Eventually, MII would announce that HQ-VCD which incorporates patents owned by the major international electronics companies was chosen along with the inclusion of unspecified intellectual property from MII's internally developed format. In September

1998, the Chinese authorities announced the new standard, officially known as Super VCD (SVCD) (Linden 2003, 8).

From his analyses of the Super VCD case Linden (2003, 8) has concluded that the VCD industry did not offer a very attractive target for policy intervention, having only a small market window before DVD players would become the dominant player, which would happen in the Chinese market in late 2002. However, VCD and SVCD players became, briefly, an important export item. In 1999, 6% of China's audio-visual exports were VCD players. Millions of units were exported primarily to other Asian countries.

Year	**Number of VCD Players**	**Number of DVD Players**
1994	20,000	-
1995	630,000	-
1996	2.85 million	-
1997	10.96 million	40,000
1998	14.30 million	300,000
1999	22.00 million	1 million
2000	21.50 million	3 million

Table 2: VCD and DVD Sales in China (All Brands and Models) (Linden 2003, 9).

In the DVD sector, for instance, China accounted for more than 90% of world production in 2006 (Suttmeier, Tan and Yao 2006, 10-11). However, entry into the DVD market was very costly from the Chinese perspective. The DVD case has strongly influenced the development of Chinese indigenous innovation policies. The patent holders required license fees of $15 to $20 per player. In addition to two DVD patent

pools, additional license fees were also demanded by Thomson Multimedia, Dolby Labs and several other owners of compression and copy protection technologies. Chinese companies have started to face the pressure of the patent holders, while China's WTO accession negotiations were still continuing. In 2002, the primary patent holders (Toshiba, Matsushita, JVC, Mitsubishi, Hitachi, and Time Warner) negotiated a rate of about $4 per player and a second group of patent holders (Philips, Sony, and Pioneer) negotiated a rate of $5 per unit. Although the issue remained unresolved as of 2003, the value of the concession was estimated to be about $50 million. According to Linden, the royalty issue, which was largely undisputed in the case of VCD players, came to a head for DVD players because of the dominance of the Japanese market in the sector. "Whereas VCD players were mostly for internal Chinese consumption, exports of DVD players from China displaced higher-priced Japanese exports to the U.S. market. This helps explain why the patent holders ultimately settled for royalties on exported players only" (Linden 2003, 9-10).

When discussing the EVD technology and the standard, Suttmeier, Tan and Yao have argued that, although EVD was designed to avoid the patent trap of DVD technology, Chinese developers could not break away from DVD patents. "EVD is not a break-through in key technology and doesn't fundamentally improve storage capacity of optical discs" (Suttmeier, Tan and Yao 2006, 23).

From an observation of the DVD case, the general inference is that IPR, creating obstacles to Chinese industry especially with the high royalty rates particularly in the electronics sector, have made indigenous technologies and relevant home-made standard initiatives more critical in the eyes of Chinese policy makers.

In 2004, the Standards Administration of China (SAC) issued a draft report stressing the reasons why it urgently needed to revamp the way it developed standards (cited in Slater 2009, 5). According to this report, China's standardization system needed to be modernized because of the lack of proper technical trade protection measures to prevent easy entry of foreign products into the Chinese market. Therefore, the Chinese government shall guide national standards and strengthen the ties between intellectual property rights and standards so as to improve the proportion of self-proprietary technologies in Chinese standards.

When analyzing the Chinese initiatives to create home-made standards to avoid foreign patents, the impression is that Chinese have not confronted any international challenge in their domestic market. However, it is also viable to claim that the obstacles facing the Chinese standards in the post-WTO era for China and the restrictions of the membership would pave the way for China's Indigenous Innovation Policy Report and policies, with a multiple new strategies. Before proceeding to the following chapters about two main standards initiatives WAPI and AVS, a closer look at the Illustration 1 shall provide the time-line to see these initiatives' progress within the background of 'Indigenous Innovation Policies' and China's WTO membership.

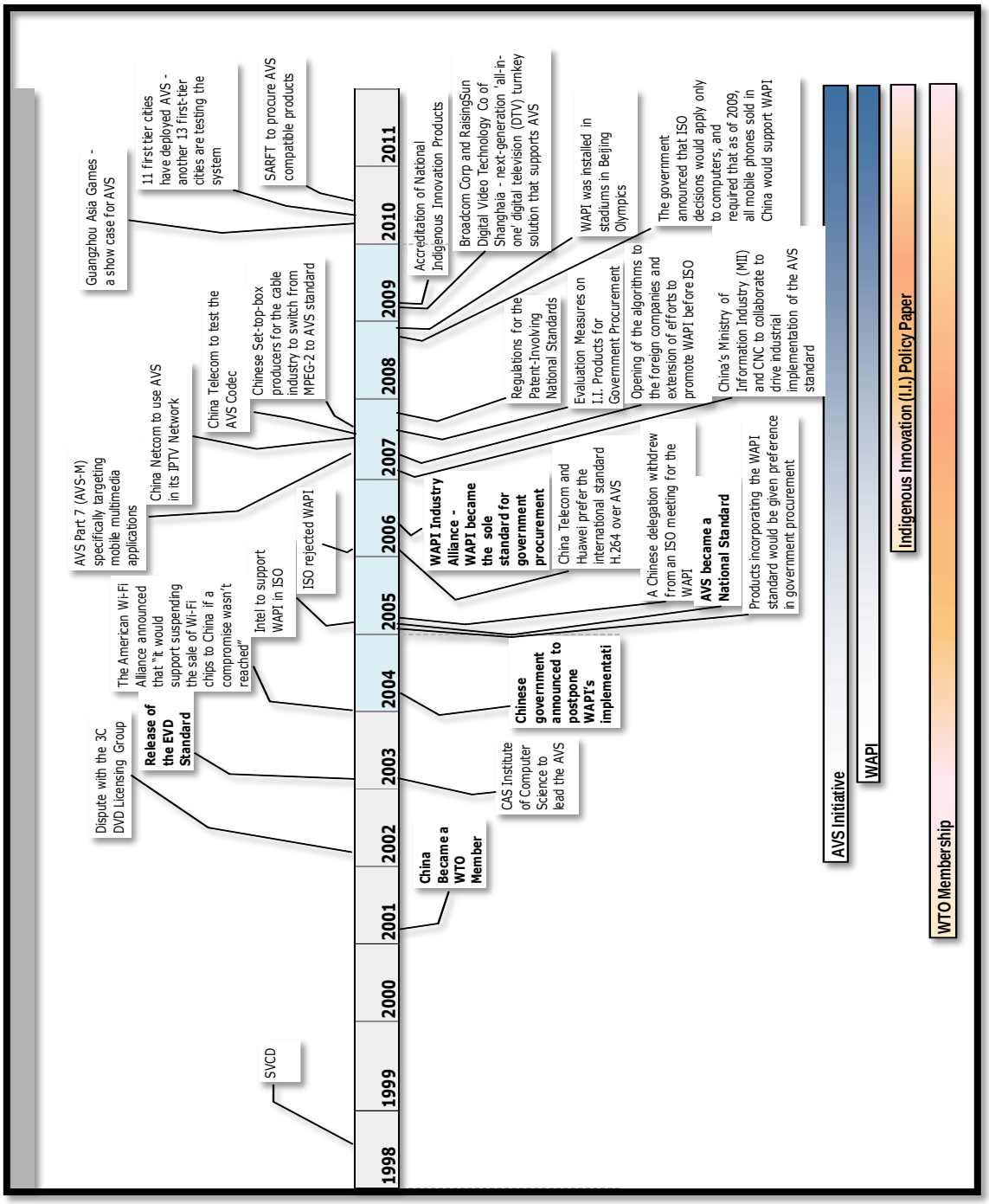

Illustration 1: Time-line for the WAPI and AVS Initiatives.

Chapter 3: The WAPI Case

WAPI is the prime example of China's home-made technology standards initiatives. China seems to have benefited from learning the trajectory of this case, the standard's rejection by the international community. Through this, China has discovered the limits of its maneuvering space in its policy implementation. Moreover, the Chinese institutions have shown their learning and adaption capacity after the drawback of the WAPI standard.

POLICY OBJECTIVES

Royalty Payments to Foreign Technologies

A review of the literature on China's indigenous innovation policies suggests that negotiations between China and the patent holders of the DVD standard is one of the underlying reasons for the WAPI and pawed the way for indigenous innovation polices. One can also easily see the traces of nationalist policies in this case, as discussed in the second chapter. According to Gibson (2007, 49-50) China's drive to create homegrown standards is essentially an attempt to control the "technological terms of its participation in the global economy."

Disputes over the IPRs for the DVD standard and the government's response, the EVD standard, exemplify the policy objectives of the Chinese policy makers and has set the stage for the WAPI standard soon after.

The main patent alliances and patent pools that hold the essential patents for the DVD industry are 6C, 4C, DTS and MPEG LA. Those bodies have charged license fees on Chinese companies, which account for almost 20% to 30% of the total product cost

and making the margin profit of each DVD less than 30 RMB (Liang and Xue 2010, 485-486).

In 2002, the 3C DVD Licensing Group, which comprises of multinational corporations such as Philips, Sony, and Pioneer, triggered a crisis with China over IPR. At that time, China produced roughly 70 per cent of home DVD players in the world market, over 30 million sets in 2002. According to many Chinese observers of this crisis, attitude of these multinational bodies have shown that they were employing an IPR strategy to corner the Chinese DVD manufacturers. Chinese manufacturers had no choice other than to develop their own patented technology to avoid increasing licensing fees. The Chinese government proceeded by developing its own format for video player products, EVD, to overcome the difficulties that Chinese manufacturers faced. The key point here is that it was only after the failed negotiations with the DVD patent holders that the government decided to support the EVD standard to reduce license fee payments and shake off dependence on foreign technologies in production (Qingjiang 2009, 756-757).

Beijing E-World Digital Technology Company, which comprise of government bodies and 10 domestic electronics manufacturers, has claimed that the new EVD format had five times the image quality of DVD movies and a higher computer data-storage capacity. However, new players compatible with EVD would be more expensive than the domestically produced DVD players (compared with US$85 for the average cost of a domestic DVD player) in China. Moreover, competitors outside China responded by developing similar high-capacity optical disc formats in order to promote the DVD technology. For example, Japanese electronics giants, Toshiba and NEC developed their next-generation DVD standard. This new standard would also be approved by the DVD

Forum, an international association of electronics makers and movie studios; just weeks after the release of the EVD standard. As a response to this counterstrategy, Chinese government agencies and the manufacturers that compromise the E-World Digital Technology Company started lobbying the Chinese government to make the EVD standard mandatory in China. Their purpose was to convince the multinational companies including the manufacturers and film distributors to adapt to this standard in order to be able to enter the Chinese market (Qingjiang 2009, 757).

Suttmeier, Tan and Yao (2006, 30) have attributed the EVS initiative to the sense of Chinese manufacturers that they do not gain what they deserve:

Motivations for initiating a new standard are closely linked to the sense that the 'relative gains' from becoming the 'workshop of the world' are not to China's liking. Although benefiting in absolute terms from participation in international production networks, Chinese firms often feel that they are not getting a fair return because of excessive royalties on licensed technologies. Because the intellectual property that is incorporated into technical standards lies in the hands of foreign companies, license fees are thought to cut unacceptably deeply into the profits of Chinese firms.

A report by the National Bureau of Asian Research has also suggested that there are 'complex motivations' behind China's standards strategies (cited in Suttmeier and Xiangkui 2004, 3). With respect to standards and the intellectual property belonging to foreign companies, the same report has provided an account of the Chinese perspective:

[China's] participation in the global economy is largely defined by its role in international production networks established by others. These networks employ technical standards and technological architectures set by the multinational corporations, which are able to capture value from their control over standards and

intellectual property. Thus, while China's absolute gains have been significant, it remains more than a little dissatisfied with the relative gains it realizes in comparison with international technology leaders—often seeing itself, for instance, in a 'patent trap' that requires it to pay substantial royalties to others out of the sales of its manufacturers.

Gibson (2007, 22) has also stressed to the feeling developed among Chinese authorities and manufacturers that companies in developed countries influence the international standard setting processes by hiding underlying patents into the standards, creating an "inappropriate convergence" between standards and IP rights.

In April 2007, Yi Xiaozhum, the vice-minister of China's Ministry of Commerce stated that: "[d]elayed or inadequate IPR disclosure, stringent IPR licensing conditions and expensive licensing fees run counter to fair competition, hinder the promotion and application of new technologies, obstruct the normal operation of international trade and impede the harmonious development of global economy and society". He also emphasized that "developing countries are worst hit by such problems which effectively hinders their greater participation in economic globalization." The vice-minister concluded his speech by emphasizing the smooth implementation of the TBT Agreement: "attention should be given on the one hand to the efficiency and quality of setting international standards, and on the other hand to the difficulties members face in adopting international standards" (quoted in Gibson, Paper 43 2007, 22).

In this context, China has embarked on developing an extensive research and innovation policy framework to increase its relative gains from participation to international economic system. These strategies have expanded to the building of a Chinese intellectual property portfolio and the incorporation of Chinese IP into Chinese-developed standards (Suttmeier, Tan and Yao 2006, 1).

The Chinese authorities have also proceeded to adapt to the WTO's international monitoring system and focused its efforts on IPR. For instance, in a noteworthy case, the Chinese News Web reported in December 10 of 2005 that Professor Zhang Ping, an IPR Professor at the Peking University issued an invalidation appeal for a patent owned by Philips, which was included in 4C patent pool as an essential patent for DVDs (quoted in Liang and Xue 2010, 489). He claimed that the patent did not meet the creativity and novelty requirements. By January 2006, another four famous scholars also joined him. At the end of one year's negotiations, Philips compromised with the plaintiffs by agreeing to withdraw the patent from the patent pool. However, this withdrawal alone would not suffice to reduce the royalty payment rate for the Chinese manufacturers.

Nevertheless, in most cases, the Chinese government has not announced officially approved industrial strategy papers that address these issues, even a casual observation of the various news sources and reports reveals that a certain strategy has been pursued. According to a report by the Bureau of Export Administration (1999, 21) China's industrial policy for the electronics industry (as well as for other key sectors) continuously updated in terms of investment, trade, and technology transfer provisions by the government as needed. According to the same report, the policy of China's Ministry of Electronics Industry is not to "encourage technology transfers or establishment of joint ventures in China if out-of-date technologies are involved."

Clearly, in order to increase its relative gains from participation to international economic system, China needs to acquire foreign technology. For instance, China's Five-Year Plan (1996-2000) called specifically for development of advanced integrated circuits to achieve the 0.3 submicron level by 2000. Foreign capital and technological know-how is necessary for the development of this strategic sector to advance China's

domestic Integrated Circuits manufacturing capabilities and to meet the domestic demand that Chinese firms are currently not able to meet (The Bureau of Export Administration 1999, 32).

China's Strategies

China appears to have a bargaining advantage vis-à-vis foreign companies that own patents underlying those technologies to acquire foreign technology; the government's overall practice is to persuade foreign companies to transfer technology in exchange for market access. China uses its superior bargaining power to force foreign companies to accept unreasonably low royalties that are significantly below prevailing rates in other markets. These policies are declared to be inconsistent with the fundamental rights conferred by patent to technology owners and constitute an express violation, or at least nullification or impairment, of TRIPS patent provisions (United States Information Technology Office 2010, 12).

Although, such technology transfer requirements are not spelled out in Chinese law. Most of the time, however, Chinese authorities and officials are allegedly unambiguous during negotiations with foreign companies that market access is available only in exchange for technology transfer. They also regularly attempt to play one foreign company against another. The lack of transparency also contributes to the ambiguity of the business climate (The Bureau of Export Administration 1999, 21).

In the VCD players' case, for instance, China appears to have found a way to compensate Japanese and European companies (Matsushita, JVC, Sony and Philips) which owned the patents covering the VideoCD 1.0 and 2.0 standards in its domestic market. According to Linden (2003, 6) these royalty free standards contributed to the

affordability of Chinese VCD players. And, all these patent holding companies had large scale investments in China and agreed to compromise with the government.

Reportedly, foreign companies that have first developed their technologies outside China and have not found a way to circumvent regulations through establishing a joint venture with a local company or entering alliances with 'differentially treated' domestic companies are excluded from the government procurement market in China (Lubman 2010).

According to the Semiconductor Equipment & Materials International (SEMI) Group, joint venture approval, which is the only way for foreign companies to operate in most of the Chinese sectors, is often restricted to those companies that promise a certain level of technology transfer (The Bureau of Export Administration 1999, 32). Macgregor (Time to Rethink U.S.- China Trade Relations 2010) has contended that China is a 'pay-to-play' market for foreigners, with mandated joint ventures in key industries, local manufacturing requirements and forced technology transfers as the price of market admission: "The poster child is the evolving 'indigenous innovation' policy, which appears aimed at using China's market power to coerce foreign companies to transfer and license their latest technology for 'co-innovation' and 'e-innovation' by Chinese companies."

In addition, the Chinese authorities have been reported to impose restrictive policies upon economic actors to limit the royalty payments to foreign companies that own the patents in standards. In a recent legal case in which the plaintiff alleged infringement of its patent that had been incorporated into an industrial standard issued by the Ministry of Construction, the Supreme People's Court concluded that:

If a patentee engages in the setting of a standard or agrees having the patent incorporated into a national, industrial or local standard, it would be deemed that the patentee permits others to exploit the patent while implementing the standard; others' such exploitation / implementation of the patent does not constitute patent infringement provided by Article 11 of the Patent Law. Patentee may ask the exploiter/implementer to pay a fee for use of the patent, but the amount of fee should be significantly lower than the normal license fee. In case that the patentee commits to give up the fee for such exploitation of the patent that commitment should be followed. (quoted in United States Information Technology Office 2010, 12)

Protection of the Domestic Market

As some aspects of the Japanese policies to use national standards as a non-tariff barrier to international trade are examined in the previous chapter, one of the explanations that I develop to account for China's home-made standards initiatives is to protect its domestic market from foreign competition. However, with the GATT and the establishment of the WTO, implementing non-tariff barriers to trade have become more difficult for within the international trade system. Hence, protection through mandatory national standards has become even harder to implement. Even though, the TBT Agreement has set the stage for the prohibition of mandatory national standards which are not in-conformity with international standards, as a matter of fact, it is still a viable option for the signatory countries to use national standards in public procurement or through government companies. However, even those national standards must depend on or be in conformity with relevant international standards, unless governments have a reasonable reason to do otherwise.

This is in part why; China has the motivation to use Chinese standards in its domestic market through the government's procurement activities or government corporations. It is possible to make national standards mandatory for public procurement as much as to exclude products that have not been produced with domestic technology.

HISTORY OF WAPI

In examining the China's policy approaches and strategies after the WTO membership, it is critically instructive to take into account China's experience with the WAPI. This chapter concludes that the change in strategies and the emphasis put on home-made standards initiatives reflect not only the WTO membership process of China and the requirements of international agreements, but also, the growing awareness and reactions of other countries against China, as exemplified by the WAPI.

In 2003, a coalition of eight Chinese ministries announced that by June 1, 2004 all wireless devices sold in China must include support for a new Chinese home-grown standard (WAPI) for wireless local area networking (or WLAN). This new standard was developed for computers and other networking equipment in China for communicating with wireless hotspots, printers and other accessories. Despite the provisions of the TBT Agreement, China announced that this new mandatory standard for the Chinese market was necessary for security reasons to overcome the vulnerabilities of the international WLAN standard. New standard was promoted to resolve security loopholes in a protocol known as 802.11, or Wi-Fi, the global standard for wireless networking (Macgregor n.d., 28).

However, it suffered from a number of technical limitations. The government also made compliance with this new Chinese standard mandatory for many types electronic equipments such as Centrino notebooks and personal digital assistants and other devices,

irrespective of their origin, affecting a multibillion-dollar industry. What makes the WAPI standard more troubling for the foreigners is that foreign computer and chip makers were required to partner with one of the 24 Chinese companies to which the WAPI standard had been disclosed, if they want to continue their access to the Chinese market. The government provided these Chinese companies with the necessary algorithms. This may entail providing 'technical product specifications', confidential designs and encryption technologies, to potential competitors if they want to market their products in China, and according to the United States Trade Representative, a clear violation of national treatment under the TBT provisions (Suttmeier and Xiangkui 2004, 27-28).

Foreign companies have also raised their concerns that WAPI will force them to produce separate products for the Chinese and the global market. These concerns would immediately escalate into a major trade dispute (Macgregor n.d., 29-30).

By contrast, South Korea has provided its manufacturers with an alternative system that help them with the royalty requirement of the international standards. However, South Korea has not made the standard mandatory or imposed further restrictions on manufacturers. Although the installation of WIPI was mandated as the mobile platform standard in South Korea, mobile platform developers are still able to compete for better platforms if they satisfy the WIPI specifications (Lee and Oh 2008, 669).

International Criticism and Drawback

The international reaction which triggered a major trade dispute, stemmed clearly from China's imposing of WAPI in place of internationally accepted standard Wi-Fi. In January 2004, the American Wi-Fi Alliance announced that: "it would support

suspending the sale of Wi-Fi chips to China if a compromise wasn't reached" (quoted in Macgregor n.d., 29).

The US Trade Representative Robert Zoellick announced that the WAPI encryption technology is "differing significantly from the internationally recognized standard that U.S. companies have adopted for global production" (quoted in Kennedy 2006, 52).

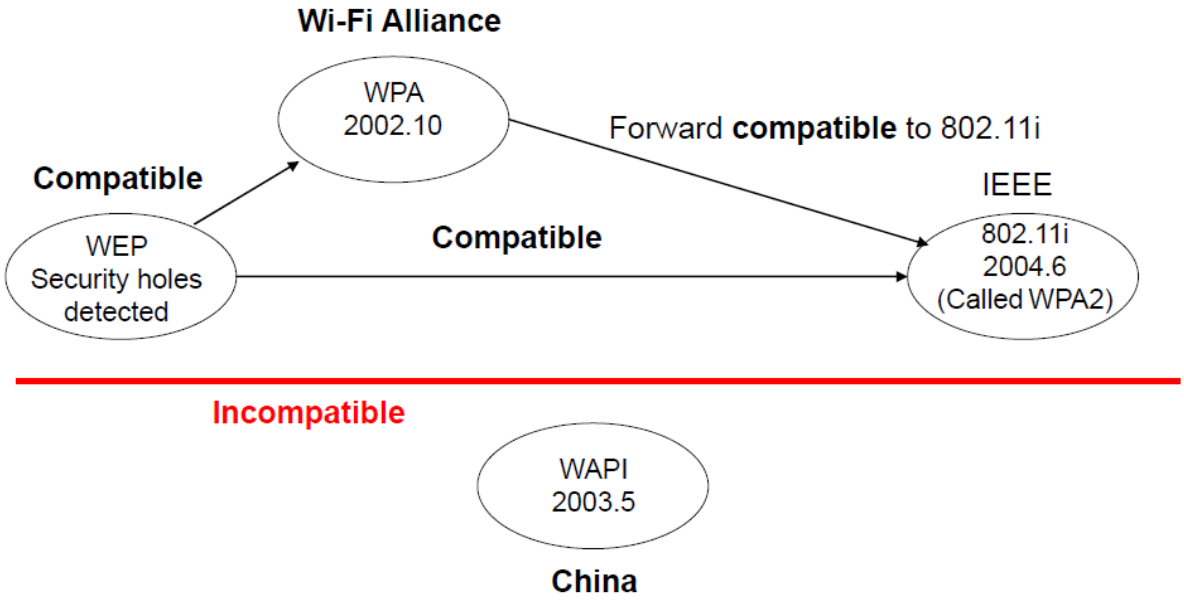

Illustration 2: The Relationship between WAPI and Other Protocols (Lee and Oh 2008).

Secretary of Commerce Donald Evans and Secretary of State Colin Powell criticized the WAPI on the grounds that:

China would be the only country in the world mandating a specific encryption standard for general consumer use. Since this standard is unique to China, implementation will impose a significant new burden on both foreign and Chinese

domestic suppliers. Furthermore, implementation of this standard will make Chinese products incompatible with internationally-accepted standards, isolating China from the larger world market…. We are particularly concerned that the new rules would require foreign suppliers to enter into joint ventures with Chinese companies and transfer technology to them. Such compelled investment and technology transfer would appear to be inconsistent with China's WTO commitments. (quoted in Gibson, Paper 43 2007, 34-35).

The high technology community in the United States, with the help of the Department of Commerce and the US Trade Representative reportedly made extraordinary efforts to reverse Chinese WAPI policy by using both formal ways and informal ways through enlisting Cabinet level political support to pressure Beijing to reconsider the Chinese position (Kennedy, The Political Economy of Standards Coalitions: Explaining China‘s Involvement in High-Tech Standards Wars 2006, 52).

Intel was one of the few companies that openly confronted the Chinese authorities for the WAPI, by not meeting China’s June 1 deadline for adhering to WAPI (Flynn 2004). Intel declared that ‘‘after a considerable amount of analysis we have decided not to support WAPI or produce any product that supports WAPI. We have concerns about its deployment and performance and the quality of user experience.’’ The company argued that WAPI was more than a generation behind current technologies (Foremski 2004).

Most of the foreign companies maintained a united front in opposing the WAPI standard (Suttmeier and Xiangkui 2004, 30), as exemplified by the president of the US Semiconductor Industry Association, George Scalise commenting that: “a unique Chinese national standard will slow the development of China’s information technology industries

because it will hamper the ability of Chinese firms to access the innovations emerging from thousands of companies around the world" (quoted in Suttmeier and Xiangkui 2004, 30).

Only a few foreign companies would begin trying to comply with the standard and collaborating with potential Chinese partners that have the encryption codes, including BenQ, D-Link, CyberTAN, Atheros, Netgear, Linksys, and Texas Instruments (Kennedy, The Political Economy of Standards Coalitions: Explaining China's Involvement in High-Tech Standards Wars 2006, 52).

Confronting an international trade dispute, in 2004, the Chinese government announced to postpone WAPI's implementation, Vice-Premier Wu Yi announced that: "China would 'indefinitely delay' WAPI enforcement" (quoted in Macgregor n.d., 29).

However, despite the government's announcement of its pledge to suspend implementation of WAPI as a mandatory standard, it would declare in 2005 that products incorporating the WAPI standard would be given preference in government procurement (Trade Lawyers Advisory Group 2007, 21). It is noteworthy that this announcement came shortly before the release of the Indigenous Innovation Policy Paper.

Despite the international criticism and the announcements of the International Wi-Fi Alliance against the WAPI initiative, China proceeded one step further and sent WAPI for recognition by the ISO (Gibson, Paper 43 2007, 35-36). Some feared that China would try to promote WAPI as a global standard. Many foreign companies, especially US chipmakers, asked for intervention from their governments, and the dispute would involve the US government.

Interestingly, some multi-national companies supported China in this process. Suttmeier and Yao (2004, 30) have reported that Texas Instruments (TI) indicated its

intention to support the WAPI standard, TI's general manager for Asia Cheng Tianzong said that: "it is reasonable for China to make its own standards in light of its national security concerns and that, furthermore, Texas Instruments needs the Chinese market and wants to cooperate with Chinese enterprises" (quoted in Suttmeier and Xiangkui 2004, 30). In January 2005, according to China Business Daily News, Intel changed its initial position and announced that ''the company always supports open standards that are consistent with international ones, and supports the Chinese government in submitting the amended WAPI Standard proposal to ISO (quoted in Lee and Oh 2008, 666).

An agreement was made between the US and China that WAPI would be reviewed by IEEE. According to this agreement, WAPI might have gone through the process of becoming an international standard. In November 2004, the WAPI standard was listed as a formal proposal along with the IEEE802.11i proposal at the annual ISO/IEC Joint Technical Committee Subcommittee for 'telecommunications and information exchange between systems' meeting. However, visas were denied for some of the Chinese delegates who would attend the meeting in the US. A follow-on session of ISO/ IEC JTC1 S6 was held in February 2005 in Frankfurt, Germany (Lee and Oh 2008, 666). However, in February 2005, the Chinese delegation was reported to withdraw from the ISO meeting in Frankfurt, Germany, and to allege 'unfair treatment' and that WAPI was blocked by 'international monopoly forces.' In March 2006, the ISO rejected the proposed WAPI standard and instead, adopted the Institute of Electrical and Electronics Engineers' (IEEE) 802.11i security specification (Gibson, Paper 43 2007, 35-36). "Xinhua news agency huffed that the rejection was the result of an 'organized conspiracy against China" (Macgregor n.d., 29-30).

According to Yan (ISO Meeting Fails to Back WAPI Standard 2005), this international rejection and the events amount to a strategy against China's WAPI standard, perpetrated to make the Wi-Fi standard a de facto standard in the market during the extended time.

The failure of the WAPI initiative appears to have stemmed from the power of the international coalition compromising of major multinational companies. WAPI was supported by a narrow coalition; SEMC and the BWIPS drafting group, led by IWNCOMM, and two dozen Chinese companies licensed to receive the WAPI algorithm, including Lenovo, Founder, Qinghua Tongfang, Huawei, and TCL. These companies could either produce their own WAPI compatible products or cooperate with foreign technology companies. However, only a few reportedly had much enthusiasm for WAPI (Kennedy, The Political Economy of Standards Coalitions: Explaining China's Involvement in High-Tech Standards Wars 2006, 52). In addition, foreign firms were excluded from the standard setting in the WAPI case on the grounds of national security. The WAPI case showed strong political over tones which explain the closure of the WAPI organization to foreign firms, and WAPI's staying power may be explained by the influence of the security bureaucracy on Chinese policy. According to Lee and Oh (2008 668), by closing itself to others, WAPI's support coalition would be destined to be narrow.

In light of these observations, this is one of the important lessons that the Chinese authorities have learned from this international case. This point shall be continued to be examined in the AVS case in the fourth chapter.

ANALYZING THE WAPI CASE UNDER THE WTO

In analyzing the transformation of the government strategies for the promotion of the WAPI standard through the Indigenous Innovation Policies, it is clear that it is the international reactions and pressures that made the Chinese government withdraw from its initial position. But, one key element that needs to be taken into account when studying the WAPI case and other standards initiatives is the international law underlying these cases within the scope of China's WTO membership. Two international agreements concern China most in its strategy change.

From the Perspective of the TBT Agreement

In this section, WAPI case is discussed with respect to the international law, particularly its mandatory nature, and disclosure of its encryption codes to only specific Chinese companies. However, these views presented in this section, analyze the case before opening of the encryption codes to foreign companies and lift of the obligations for mandatory acceptance of the standard.

While, according to the TBT Agreement, where relevant international standards exist, members shall use them as a basis for their technical regulations except when such international standards are deemed to be ineffective or inappropriate means for the fulfillment of the legitimate objectives pursued (TBT Agreement, Article 2.4.). This provision means that if an international standard exists, and that standard would be effective in accomplishing a government's legitimate regulatory objectives, the international standard must be used (Cromer 2005, 6). Yet, the TBT Committee rejects the creation of an exhaustive list of approved international standardizing bodies (Trade Lawyers Advisory Group 2007, 64).

However, in the WAPI case, Trade Lawyer's Advisory Group (2007, 64) has reported that China's formal definition of international standards is limited to those promulgated by the ISO, IEC, ITU and certain other international organizations approved by the ISO. The Advisory Group has criticized China for that: "this definition discriminates against both U.S.-based standards organizations that develop internationally accepted standards and the thousands of large and small U.S. manufacturers that use these standards in their products."

A review of the WTO Appellate Body decisions suggests that internationally accepted standards need not to be agreed by consensus. The Appellate Body in the EC – Sardines case, for instance, rejected the EC's argument that an international standard requires consensus. According to Cromer (2005, 7), China's lack of acceptance of the Wi-Fi standard would not change this. Hence, the test for whether a standard exists depends on whether a 'recognized body' of the international standardization community adopted it, not on whether all parties agreed to such a standard. Wi-Fi is an international standard. Because an international standard exists, China is obligated to base its regulations on this standard unless Wi-Fi "would be an ineffective or inappropriate means for the fulfillment of legitimate objectives" (Cromer 2005, 7).

Gibson (2007, 63) has also concluded that the 802.11 wireless standard is an international standard, as it has been approved by ISO as an international standard, and ISO is a 'recognized body' within the sense used by the Appellate Body.

Another key factor for examining the legality of the WAPI case is that the TBT imposes an additional obligation on Members to ensure that technical regulations shall not be more trade-restrictive than necessary to fulfill a legitimate objective. Hence, according to Cromer (2005, 7-8), the manner in which China chose to implement its

WAPI policy, requiring foreign manufacturers to negotiate licenses with a limited number of Chinese firms, is more trade-restrictive than necessary to accomplish its information security objective. Even if WAPI is necessary to protect China's legitimate objectives, the policy would probably still match the TBT criteria, as it is applied in a discriminatory manner. Only a limited number of domestic companies were given the encryption code of the WAPI standard, whereas foreign companies can gain access to it through these Chinese companies. The WAPI policy seemed to violate the National Treatment principle of the WTO, and "the exceptions do not excuse such discrimination" (10).

A major finding of the analysis of the WAPI case done by Gibson (Gibson, Paper 43 2007, 56-59) is that: "more narrowly tailored means could have been used to meet national security objectives, while minimizing the disruptive impact on trade in wireless products. China would have to justify such licensing practices as not more trade-restrictive than necessary to fulfill legitimate objectives."

However, according to the University of Texas at Austin Law Professor Patricia Hansen (pers. comm., 2/22/2011): 'National Security Argument' is of self judging nature, as exemplified by the use of this argument by the US in the past. Given the international objection to the Helms-Burton Act, "[if other countries bring the case to the WTO Appellate Body] the US announced that it would not even show up in the panel." Moreover, in examining the Helms-Burton Act for compliance with the WTO rules, Jackson and Lowenfeld (1997) wrote that: "very few GATT cases (and so far, no WTO cases) have addressed the meaning of Article XXI. There is some GATT practice supporting 'auto-determination', but the only time a GATT panel has favored this approach, its view was constrained by particular 'terms of reference' to the panel, which

are not today present in the case." In their view, China's 'National Security Argument' is still open to questions, as no panel has addressed a similar issue and provided a proper explanation.

The mandatory nature of WAPI, if it had been implemented as intended, would adversely affect the internal sale or use of foreign wireless equipment incorporating the international 802.11i standard. According to Gibson (2007, 56): "any effort to prevent sale of equipment using the 802.11i standard while mandating WAPI could be viewed as a violation of the national treatment principle, found in both GATT III:4 and in Article 2.1 of the TBT Agreement."

There is also an apparent similarity between the WAPI and WTO Shrimp Turtle cases. In the latter case, the WTO found a violation of the international law due to "the unilateral approach of the United States to impose a standard, rather than negotiate with its trade partners to find a solution to the problem of sea turtle conservation" (58).

The WAPI standard was also criticized for violating the TBT Principles of openness and impartiality. For openness, these principles provide that international standardizing bodies should be open on a non-discriminatory basis to relevant bodies of all WTO members and that "meaningful opportunities to contribute to the elaboration of an international standard so that the standard development process will not give privilege to, or favor the interests of, a particular supplier/s, country/ies or region/s" (66). The concept of openness here involves participation at the policy development level and every other stage of standards development. And, Gibson (2007, 65-67) has concluded that China's closed approach for the WAPI does not match these criteria.

China's call for change within the framework of the TBT Agreement, to address unfairness in international standard setting and more detailed rules governing IP in

connection with international standards is also noteworthy. These efforts might also reflect China's own acceptance of its being fault with international rules within the framework of the WTO (44-45). As, "there is no basis under WTO rules for asserting that IP issues, which China claims, have become an obstacle to trade, provide grounds for mandating a national WAPI regulation (particularly one developed in a closed and exclusionary process)" (59).

Although, the Accession Protocol for China is silent about its 'developing country status,' Chinese representatives, on many occasions, tend to use the argument that China is still a developing country and as a late-comer, has not participated in international standards setting activities adequately. However, against this argument, Gibson (2007, 67) has contended that under the recent reforms of the WTO, the focus is on improving developing countries' participation in international activities, not granting them grounds to use discriminatory standard development processes at home.

From the Perspective of the TRIPS Agreement

Some of the views about the compliance of the WAPI standard with the provisions and principles of the TBT Agreement have been presented in the previous section; however, the TBT Agreement does not adequately satisfy the concerns of developing countries over IPR. The TRIPS Agreement, whereas, seems to address some of these concerns.

The study conducted by Dinwoodie, et al. (2008, 449-450) has illustrated the potential provisions that arm developing countries with legal grounds for maintaining a considerable degree of domestic control over intellectual property policies in a post TRIPS environment:

Beyond traditional notions of 'public interest' and 'abuse', the TRIPS Agreement introduces new and more expansive concepts whose outer limits have yet to be delineated at the international level. In particular, article 7 stresses 'the promotion of technological innovation and … the transfer and dissemination of technology … in a manner conducive to social and economic welfare' Article 8(1) expands potential public-interest exceptions to sectors other than public health and nutrition that are 'of vital importance to … socio-economic and technological base,' and it must be read in conjunction with the other provisions favoring this group of countries.

Imposition of compulsory licenses within Article 31 of the TRIPS Agreement and article 5A of the Paris Convention can also be listed along these provisions. This interpretation of these provisions opens new possibilities for developing countries. However, the meaning of any particular clause must emerge from evolving state practice, and eventually, specific public-interest safeguards essential to national economic development will have to be worked out on a case-by case basis (Dinwoodie, et al. 2008, 449-450). Within the general purpose of this study, in trying to assess the alleged violations of foreign IPR in China's home-made standards, the methods that developing countries can enforce lax IPR are crucial. Dinwoodie, et al. (2008, 448) have explored some of these possibilities:

Article 30 of the TRIPS Agreement declares that states should tolerate only 'limited exceptions to the exclusive rights' that article 28 confers. But other articles permit exceptions to the exclusive rights when needed "to protect public health and nutrition, and to promote the public interest in sectors of vital importance" to economic development; to prevent 'abuse of intellectual property rights,' including the imposition of unreasonable commercial terms; and to counteract unreasonable trade restraints and

practices that 'adversely affect the international transfer of technology.' Governments may also attempt to invoke language in article 7 that envisions the maintenance of social and economic welfare as further grounds for regulatory action limiting grants of exclusive rights in appropriate circumstances. These and other articles thus preserve, and may even expand, preexisting grounds for limiting a patentee's exclusive rights under 5A of the Paris Convention, which some developed country delegations had hoped to abrogate.

However, China has not taken any formal measure to apply those provisions. In particular, to date, there has not been any published report of a compulsory license granted to practice a non-Chinese corporation's patent (Lim 2006).

The critical point here is that the scope of use without authorization, under Article 31 of the TRIPS Agreement, is limited to 'public non-commercial use' and 'supply of the domestic market' (Li and Baisheng 2009). Although, Article 5 of the Paris Convention and Article 31 of the TRIPS Agreement allow the granting of compulsory licensing, there are many limits on using it. According to Article 31 of the TRIPS Agreement, for instance, any compulsory licensing "shall be authorized predominantly for the supply of the domestic market of the Member authorizing such use" (Zhan and Zhu 2007, 191). In addition, "such use may only be permitted if, prior to such use, the proposed user has made efforts to obtain authorization from the right holder on reasonable commercial terms and conditions and that such efforts have not been successful within a reasonable period of time." Furthermore, the Memorandum of Understanding between China and the US on the IPR (1992) also set many limits on using compulsory licensing. The application of compulsory licensing requires that they do not unreasonably conflict with a normal exploitation of the patent (Li and Baisheng 2009, 28-29).

Despite the fact that China has not applied compulsory licensing under Article 31 of the TRIPS Agreement for the IPR in the WAPI or other home-made standards initiatives, China might adhere to applying those provisions to foreign patents when the policy makers intend to promote the WAPI and other home-made standards in other narrow, complementary marketing segments. In such a case, given the weak IPR protection in the country, such an action would hardly surprise anyone.

A decision by the Supreme People's Court of China (SPC) adjudicates a case in which the plaintiff alleged infringement of its patent that had been incorporated into an industrial standard issued by the Ministry of Construction. In that critical case, the SPC decided that:

Whereas the standard-setting authorities in China have not established public disclosure and use rules of patent information in relevant standards, if a patentee engages in the setting of a standard or agrees having the patent incorporated into a national, industrial or local standard, it would be deemed that the patentee permits others to exploit the patent while implementing the standard; Others' such exploitation / implementation of the patent does not constitute patent infringement provided by Article 11 of the Patent Law. Patentee may ask the exploiter/implementer to pay a fee for use of the patent, but the amount of fee should be significantly lower than the normal license fee. In case that the patentee commits to give up the fee for such exploitation of the patent, that commitment should be followed. (quoted in United States Information Technology Office, 2010, 12.

As a last remark of this section, as regards China's decision in 2005 to use the WAPI standard for public procurement, or by government companies on a non-mandatory basis; Gibson (2007, 65) has argued that still the international standard should

be used as a basis for the non-mandatory national standard, as stipulated by the TBT Agreement Code of Good Practice. Even if China uses the WAPI standard only for public procurement and government bodies, "China will need to explain why it did not use the 802.11 standard as the basis for developing its own WAPI standard to address security deficiencies" (Gibson, Paper 43 2007, 65).

From the review of the literature and the comments on the WAPI case, the overall impression is that the key factor that made China withdraw from its initial stand is not the fear that the case might be brought after the WTO Appellate Body. Rather, the international reaction and the criticism appear to have played a more important role in this decision. Yet, China has turned to the game with more flexible strategies to overcome any obstacle.

THE INDIGENOUS INNOVATION POLICY PAPER AND THE CHANGE IN STRATEGIES

The Provisional Measures for the Accreditation of National Indigenous Innovation Products

China's technology policies, particularly policies concerning the WAPI initiative, have taken a new form and set new and more challenging goals in 2006 with the official declaration of the Indigenous Innovation Policy Report.

When China became a member of the WTO, it was expected to harmonize its national standards with international standards and strengthen its IPR regime. By the end of 2004, China had 21,342 national standards, of which 3,045 were compulsory. 9,381 standards had been either international standards adopted as national standards or had been derived from international standards, including 4,917 ISO standards and 1,902 IEC standards (Suttmeier, Tan and Yao 2006, 13).

WTO membership would appear to be a threshold for China, as the country seems to have been bothered by several IPR issues, as examined in the DVD case. IPR have also become a major issue for the Chinese government institutions.

China was expected to open its standards setting processes to foreign participation, in conformity with the WTO rules. However, in 2005, the Ministry of Information and Industry (MII) allowed foreign participation in Chinese standardization activities only on condition that those companies transfer their patents at minimal costs. However, only a few foreign companies chose to participate on those terms (Slater 2009, 6).

In this new era, Chinese authorities have also decided to bring IPR and international standards issues to the WTO, as they regard them as obstacles to the development of China's industrial and technological capacity. In mid 2005, China submitted a position paper to the WTO Committee on Technical Barriers to Trade, stating that: "IPR issues in preparing and adopting international standards have become an obstacle for Members to adopt international standards and facilitate international trade [and] WTO should explore appropriate trade policies to resolve difficulties arising from this issue." A supplemental paper submitted in 2006 also has stated that: "for more rules to better balance the interests of patent holders and users as market forces allegedly do not resolve all of the problems encountered in standards development" (quoted in Slater 2009, 6). According to Slater (2009, 6), these two WTO position papers were motivated in part by a desire to establish rules that would force the licensing of essential patents incorporated in international standards at more reasonable and predictable royalty rates. However, none of these efforts would succeed in changing the international standard setting framework that China has so long complained about.

In this context, China's WAPI initiative would be reshaped by the government's release of the Indigenous Innovation Policy Paper in 2006. According to this policy paper, entitled 'The Provisional Measures for the Accreditation of National Indigenous Innovation Products,' only products which are accepted to be made with 'indigenous' intellectual property could qualify for 'priority' in government procurement and 'national key projects that spend Treasury funds.' The ultimate goal of this policy initiative is that by 2020 local manufacturing would be based primarily on independent or indigenous innovation (Howell, et al. 2010, 19). It is presumable to conclude that the drawback China lived in the WAPI case and other similar issues have played a decisive role in the developments leading to the release of this policy paper. As discussed in the next sub-section, the release of this policy paper is also closely parallel to the change in the WAPI strategies implemented by the government authorities. The critical point with this policy paper is that it is very difficult for foreign enterprises to qualify for 'indigenous' status to be preferred for public procurement (5). The policy paper also sets certain time frames for different sectors for compliance with this policy.

One of the stated aims of the indigenous innovation policies for the government sector is to acquire products that are produced with local technology. To qualify as indigenous innovation, "a product must be produced by an enterprise that owns the intellectual property in China; has a trademark owned by a Chinese company and is registered in China; embodies a high degree of innovation; and is certified by the Chinese National Certification Commission" (Lubman 2010). These strategies have significant implications and consequences for foreign companies. In March 2010, a survey of American companies by the American Chamber of Commerce reveals that 28% of the 203 respondents reported that they are losing business because of the policy, and over

half of the 49 technology companies surveyed foresaw that the new policy would affect their business. The policy has been applied to government procurement in a series of documents on indigenous innovation issued in recent years by the State Council, the Ministries of Foreign Trade and Science and Technology and the National Development and Reform Commission (quoted in Lubman 2010). According to another survey conducted by the Chamber; foreign companies are concerned the rules are discriminatory and may extend beyond the 599 billion Yuan ($87.8 billion) government-procurement market to orders from state-owned enterprises, which last year had combined revenue of 22.5 trillion Yuan (quoted in Forsythe 2010).

In a report about China‘s indigenous innovation strategies and overall plan, Macgregor (n.d., 22) has defined these strategies as an elaborate and extensive system designed to build Chinese national champion enterprises and implement the indigenous innovation plan. It is built atop the solid base of foreign investment and ownership restrictions created in the 1990s, such as 50 per cent maximum ownership of car plants and minority ownership limits in sectors ranging from telecom to genetically modified organisms to new energy equipment. This industrial policy ecosystem includes: a domestic patent regime allowing the use of junk patents that can be employed to retaliate against foreign companies inside China which have filed IPR violation lawsuits against Chinese companies outside of China; compulsory certification and standards requirements that slow or block the entry of foreign products into the Chinese market; requirements for the disclosure of technology secrets and other proprietary information that serve to exclude foreign products from major Chinese markets; and uneven and lax enforcement of IPR protection. China has apparently focused on establishment of indigenous standards as a base for its technological capabilities.

Chinese government has also supported the Indigenous Innovation Policy Paper with other supplementary policies. '2006-2020 Medium and Long-Term Science and Technology Development Plan (2006),' for instance, favor indigenous innovation products in price-based bidding processes. According to this plan, if the price of an indigenous innovation product is higher than others, the company making the product can reduce the price in its bid. In such a situation, if the new bid price for the indigenous innovation product is not higher than other products, the government agency must procure it. In addition, several articles of '2007 Evaluation Measures on Indigenous Innovation Products for Government Procurement' award indigenous innovation products special treatment (The U.S. - China Business Council 2010, 3).

The strategies for the implementation of indigenous innovation policies have become more complicated. In October 2009, several ministries jointly issued the 'Notice on Launching the Accreditation of National Indigenous Innovation Products in 2010' and the '2009 Indigenous Innovation Products Accreditation Measures', which establish the link between Indigenous Innovation Products Catalogue and government procurement preferences. According to a United States Information Technology Office report (2010, 5), the criteria to get a product into the catalogue included a trademark originally registered in China and more importantly Chinese intellectual property. These requirements would essentially drive foreign products out of the government procurement market for several high technology sectors. Moreover, even though a national catalog has not been released so far, according to the same report "while China has since backed away from creating a national product catalog as a result of wide-spread international opposition to the program, many policies that encompass China's Indigenous Innovation drive are structural, with direct consequences for market access and the ability of

American and other foreign firms to compete in China." However, it is not clear that this is a deliberate strategy pursued by the Chinese authorities to mislead the international public interest.

In addition, the Chinese government has also started to sponsor a series of 'megaprojects' in conjunction with its High-Technology Program. Within the context of this report, the most noteworthy is a major initiative on standards, entitled 'Key Technical Standards Project' which has included research and development support for the WAPI, AVS, 3G telephony, optical networks, IP technologies, and other standards that have gained prominence for the government. 29 standards have resulted from this work, and 13 of them have been submitted to the ISO, IEC, or the International Telecommunications Union (ITU) for consideration as international standards (Suttmeier, Tan and Yao 2006, 13).

In 2010, a USITC (2010) report raised the concerns of the US industry about the release of the 'Proposed Regulations for the Administration of the Formulation and Revision of the Patent-Involving National Standards' in 2009 and rules for patented technology in standards. According to this report by the USITC (2010, 5-19), China's have draft rules established three general principles:

(1) Mandatory national standards should not incorporate patented technologies as a general principle;

(2) If a mandatory standard does involve a patent, the relevant government agency will negotiate license terms, and, failing to do that, could require compulsory licensing of relevant patents; and

(3) Patented technology relevant to national standards should not be included unless the patent holder agrees to grant a royalty-free license, or one that provides royalties at a price significantly lower than the norm.

According to the USITC, these practices are in conflict with principles followed by standards setting organizations in other countries. The US Chamber of Commerce representative, Jeremie Waterman expressed industry's concerns about the Supreme People's Court of China's guidance to lower courts suggesting that IP incorporated into a national standard need not be compensated at the market value (238-239). In January 2010, the China National Institute of Standardization (CNIS) requested comments from all stakeholders on its 'Disposal Rules for Inclusion of Patents in National Standards,' as mentioned above. The Institute changed some of the draft rules based on feedback from foreign stakeholders, and excluded a number of provisions, particularly those related to compulsory licensing in mandatory standards and to requirements that royalties be licensed on a lower-than-fair basis. However, despite the international criticism, the disposal rules "require the disclosure of pending as well as existing patents during the formulation and revision of national standards, which may prove onerous for holders of patent applications that have not yet been published" (5-19).

Remarkably, indigenous innovation policies seem to have created tension and concern among foreign investors and businesses. According to an American Chamber of Commerce survey; 28% of the 203 respondents reported that they are losing business because of the policy, and over half of the 49 technology companies surveyed foresaw that the new policy would affect their business (Lubman 2010). In addition, Business week (2010) has reported that foreign companies are concerned that the Chinese rules are discriminatory and may extend beyond the 599 billion Yuan ($87.8 billion) government-

procurement market to orders from government owned enterprises, which had combined revenue of 22.5 trillion Yuan in 2009.

In addition, there is sufficient reason to believe that these policies also include numerous informal practices which are not publicly announced. As, the Bureau of Export Administration (1999, 21) has reported that over the last several years these policies included provisions that call for advanced and continuous technology transfers as part of future joint venture agreements, preferential policies for foreign investors in China's electronics sector; export of 70 per cent of joint venture-manufactured products, high-level review and approval of certain electronics joint ventures that must 'conform to the state's industrial policies.' And joint ventures are supported by the government in 'new generation' electronics such as broadband telecommunications as well as digital mobile communications products. Although, an industrial policy for the electronics sector has not been officially published, for instance, many foreign firms are allegedly open to arbitrary decisions and pressure by local, provincial, and central governments for technology transfers or commercial offset arrangements in exchange for market access.

The Change in Strategies in WAPI

As mentioned in the previous section, China has not completely stepped back from its insistence on the WAPI standard. When the Indigenous Innovation Policy Paper was released in 2006, products incorporating the WAPI standard had already be given preference in government procurement. The Policy Paper apparently reinforced this position. Behind this initial strategy, a more complex strategy for WAPI compatible products through public procurement and coalition building to support the standard seems to have cautiously been developed.

In March 2006, after the official launch of indigenous innovation policy, the government formed a WAPI Industry Alliance compromising of 22 top domestic information technology and telecom companies. WAPI was established as the sole standard for products eligible for government procurement, and WAPI technology was decided to be installed in stadiums for the 2008 Beijing Olympics. MIIT announced that previous ISO decisions would apply only to computers, and required that as of 2009, all mobile phones sold in China would support WAPI. But they were also allowed to simultaneously have Wi-Fi. Nokia, Motorola, Samsung and majority of the companies complied with these policies (Macgregor n.d., 29-30).

In addition, this new set of strategies for WAPI includes opening of the algorithms to the foreign companies and extension of efforts to promote WAPI before ISO. China has reportedly made the WAPI algorithms public so that foreign manufacturers can enter the wireless WLAN market in China. In the signing ceremony for Intel's new integrated circuit manufacturing facility in Dalian, China, for instance, the Vice-Minister of China urged Intel to support WAPI (Gibson, Paper 43 2007, 38).

However, despite these efforts, Chinese manufacturers have still lacked confidence in WAPI and continued to use the internationally accepted standard, Wi-Fi, according to some, implying the quiet commercial death of WAPI and the continued spread of Wi-Fi across the country.

Kennedy, Suttmeier and Su (2008, 22-23) have commented that: "because of the broader coalitions supporting alternative technologies already operating beyond China, government intervention has at times delayed the introduction of foreign products but has not been able to ensure commercial success for China's own standards". An analysis of this case implies that Chinese manufacturers are interested more in the additional

transaction costs associated with use of a new standard which might not be accepted by the Global market, rather than the arguments of the Chinese government for the ‘intolerable royalty rates’ for the patents incorporated in the existing standards.

Chapter 4: The AVS Case

AVS represents China's one of the important standards initiatives after China's WTO membership. AVS's development and adaptation processes differ significantly from the early stages of WAPI before the international reaction and the release of the indigenous innovation policy paper have changed its scope. Hence, this chapter examines the AVS case in more detail, in trying to analyze the change in China's strategies for Chinese standards initiatives.

The work of the AVS Working Group is supported by many foreign observers for its transparency and openness to foreign participation. Moreover, it is generally regarded as a particularly positive example of a technically advanced and procedurally fair standards body, one that is open and internationalized in its proceedings and has devised a progressive set of policies for managing IPR issues through its patent pool system (Suttmeier, Tan and Yao 2006, 20).

The explanation that I develop to account for this change in attitudes in terms of transparency and openness is that Chinese authorities have learned a lesson from their attempt to introduce a Chinese alternative to the DVD, the EVD that failed in the market in 2003 (China - EU Information Technology Standards Research Partnership 2010, 15-16).

This standard and other supplementary standards which are designed to guarantee compatibility with AVS in other product groups are the key to the China's massive audio-visual products market. China, for instance, is expected to be world's largest digital TV market by 2012 and the China's audio-visual products market to grow even further. In addition, the market for network-capable digital consumer electronics, primarily TVs, is

also expected to surge. And according to Synerchip forecasts, digital TVs with network functions is expected to grow from about 1.5 million sets in 2008 to about 86 million in 2012 (cited in Nezu 2009).

Given the importance of the sector for China's manufacture and export, one can find it understandable for the Chinese authorities to worry about high royalties paid to the foreign patent holders in this sector. The focus and the resources spent on the AVS initiative can be explained in part with the growing concerns about royalty payments for the internationally accepted MPEG standard for digital TV. According to Breidne and Hektor's unpublished paper 'Standards Battle for Competition – ICT Strategies in China and Japan,' Chinese broadcasters wishing to use audiovisual compression technology which is based on the MPEG4 standard face licensing fees exceeding 10 billion RMB per year (cited in Suttmeier, Tan and Yao 2006, 11).

In 2002, China started the work on development of a royalty free AV standard with direct participation of 24 foreign and seven Chinese companies. After nine years after its launch, the AVS Working Group and the patent pool comprise of over 100 domestic and multinational companies (Audio and Video Coding Standard Workgroup of China n.d.). The working group compromises of such Chinese and foreign companies as Lenovo, Founder, Huawei, Intel, Legend Group, IBM, and LG, and such research institutes as Matsushita Research & Development (China), China Electronics Standardization Institute, Harbin Institute of Technology, and Electronics Standardization Institute), such universities as Tsinghua University, the University of Science and Technology of China, and Hong Kong University of Science and Technology.

In addition, many international companies and research institutes participate in the working group's activities as observant; companies like Cheertek, Fujitsu

Microelectronics (Shanghai), France Telecom China, Fujitsu Microelectronics (Shanghai), Envivio, Sony China, Texas Instruments, GSci-worx GmbH c, Sun Microsystem (China), and international research institutes like the Institute for Infocomm Research (Singapore) and the Beijing Samsung Communication Technology Research Institute (Suttmeier, Tan and Yao 2006, Appendix II)**.**

MPEG-4 is the primary alternative international standard to the AVS standard. The AVS Working Group was established with the expectation that close cooperation with MPEG-China would be maintained. In June 2003, the CAS Institute of Computer Science was selected to lead the development of video coding software. Progress has continued on the various standards that comprise the AVS package (Suttmeier, Tan and Yao 2006, 20).

Gao Wen from the CAS Institute of Computer Science has been the head of the working group since its establishment and leads the initiative. The working group is supported by the Ministry of Information Industry and under its direct control.

From the very beginning, the new AVS standard's main purpose is to replace the MPEG standard and create a royalty free environment for the Chinese audio-visual industry. The new standard was claimed to be better than MPEG-2 and less expensive than MPEG-4, and to become China's own independent standard for compression, decoding, processing and representation of digital audio-video (Suttmeier, Tan and Yao 2006, 20).

The internationally accepted standard MPEG-4 consists of 23 separate standards related to audio-video coding. The primary alternatives to the AVS standards package are MPEG-4-Part 3, also known as advanced audio coding (AAC), and MPEG-4-Part 10, for advanced video coding (AVC), which is identical to the ITU's H.264 standard. VC-1 was

also adopted as a standard by the Society of Motion Picture and Television Engineers (SMPTE) (Kennedy, Suttmeier and Su 2008, 25).

Some of the China's policy objectives behind WAPI and EVS standard initiatives, as explored in chapter three, have surfaced in the AVS standard initiative as well. The general belief is that Chinese manufacturers pay substantial royalties to the foreigners for the patents that have been unjustifiably incorporated into international standards, and that the only way for a country to change its place in the production chain is to own the technology.

In 2003, Gao Wen, the head of the AVS Working Group, has highlighted these points:

The royalty fee on every device using MPEG2 standard is US$2.5. It is estimated that Chinese consumers may buy 400 million units of digital televisions and DVD players in the next 10 years, which means they may have to pay US$1 billion. However, in the case of the AVS standard, the electronic device makers only need to pay about 1 Yuan (US$0.12) per device and AVS members could pay even less. At the same time, China may also consume 300-500 million chips using MPEG2 technology, which will create a huge market worth US$300 billion. The AVS standard is also more efficient compared with the MPEG2. The compression ratio of AVS is 2.4 times of MPEG. Using the MPEG2 technology, a normal DVD disc can only store less than 30 minutes of high-definition movies, but with the AVS standard, a disc is able to store a complete movie. (quoted in China Daily 2003)

However, despite these arguments about the need for the development of Chinese standards with Chinese technology, Chinese home-made standards allegedly have many common traits with corresponding international standards. This verifies the concerns of

foreign patent holders who are suspicious of the intentions of the Chinese policy makers. Burger, et al. (2007, 6) have claimed that the AVS video code architecture is very similar to the international H.264 standard, but its complexity has been lowered down by using only 8** blocks, five intra modes, and other features: "Performance results show that under practical conditions used as benchmark the compression efficiency is almost the same as that of H.264 without sacrificing the visual quality."

In this respect, many believe that the AVS incorporates the same foreign patents that are essential to the international standards. Moreover, a few companies that hold essential patents for the AVS standard are not members of the AVS Working Group and have not agreed to license their IP on a reasonable and nondiscriminatory basis. Another critical point is that some members of the AVS Working Group hold significant IP in the rival MPEG-4 and H.264 standards (Clendenin, Product Brief Chinese A/V Codec Rises. 2006). Hence, in examining the AVS Standard, the overall impression is that by participating into the AVS Working Group or simply keeping their silence for the use of their patents, those foreign companies have chosen to compromise with the authorities.

OBLIGATIONS TO THE PATENT POOL

The key objective of the AVS Working Group is to create a royalty free standard for the Chinese manufacture. In 2003, Gao Wen is reported to have asked a group of experts "to create a recommendation for an IPR policy for AVS or create policies that: reflect and respect China law and culture, reflect WTO requirements, reflect successful global practices balance the rights of the inventor and needs of the implementers, innovative and forward looking and evolves with practice and law in China" (quoted in Gao 2005).

Henceforth, the AVS patent pool would become a critical component of the AVS Working Group. This patent pool would be based on the principals of non-discrimination, voluntary participation, and non-exclusivity. Moreover, "the pool should provide users with a single place to get a license for all essential patents, and therefore will attempt to attract all patent holders to participate" (Huang, Gao and Reader n.d., 5). The AVS patent pool's licensing strategies are determined in a strategic framework. As, the AVS patent pool is similar to traditional pools but obeys the pre-defined competitive-price licensing by AVS IPR policy (4). Although, the participation of foreign companies in the working group and the patent pool is supported though various means, the standard initiative has a very strict attitude towards IPR incorporation into standards and does not tolerate any independent IPR decision by any member company.

According to these rules, if a member contributes a proposal, it must also disclose the patents in it and the licensing intentions. Participants have also certain obligations to commit to licensing and declare default terms for licensing their essential patents. Further, organizations contributing to the standard must disclose their intellectual property and their licensing terms for that contributed technology. The pool is expected to license only truly essential patents (4).

Cliff Reader (2006, 308), a pioneering foreign consultant to the AVS Working Group, has explained this policy in more detail:

The AVS IPR Policy has three main components. First, there is a commitment to license that is required from all AVS Members. This commitment includes a declaration of the basic license terms the IPR holder is willing to offer. Second, there is a disclosure requirement for patents, published patent applications and in certain cases, unpublished

applications. Third, there is protection for IPR holders against contribution of their IPR by third parties and preservation of their defensive patent rights.

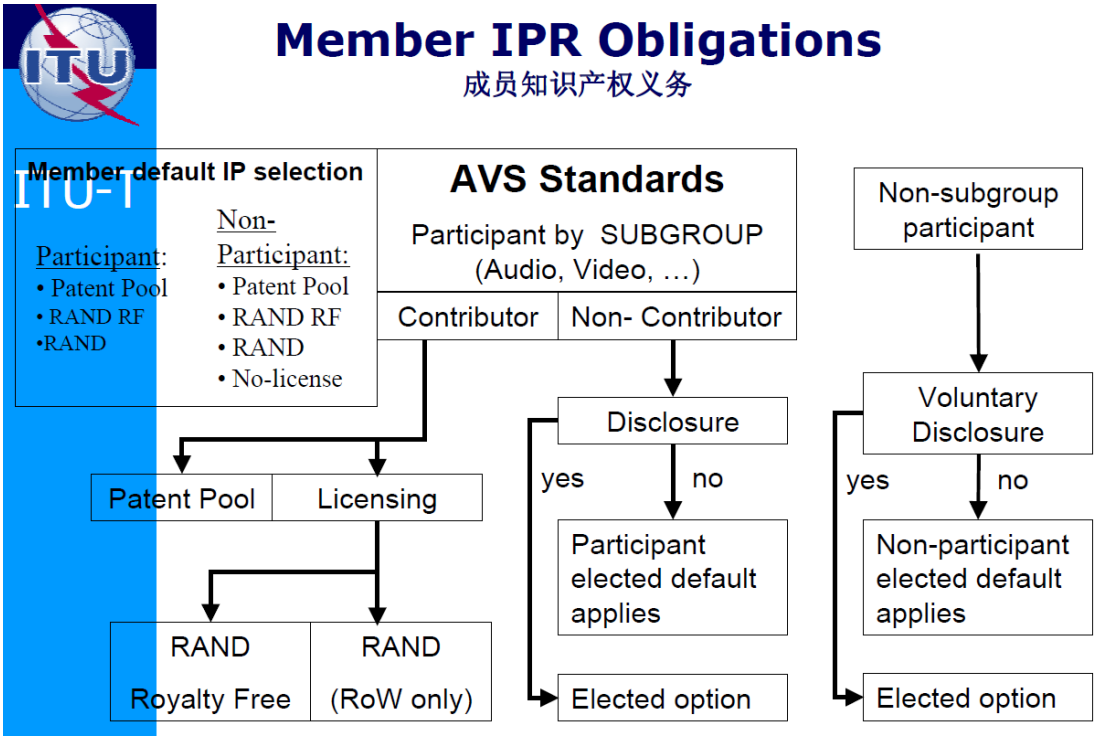

Illustration 3: The AVS Working Group IPR Obligations (Gao 2005).

More importantly, member companies' motivation for participation seems also to have stemmed from their concern that their access to the Chinese market might be restricted for their non-compliance with this initiative. The Chinese government seems to have managed to convince (or coerce) foreign companies that they should continue cooperation with the government, even after the WTO membership of the country, through a new set of indigenous innovation policy strategies. According to Burger, et al. (2007, 6-7): "not having exclusive control over the price is a big, big problem for all of these companies. That's not something they have faced before, and it is not something they can easily accept, I'm sure they are concerned about a precedent being set."

AN OPEN AND PARTICIPATORY STANDARD BODY

Many observers of the AVS Working Group have argued that the working group is independent from the direct intervention of the Chinese government (Suttmeier, Tan and Yao 2006, 34). From various news and comments about the AVS Working Group and the patent pool, the general inference, however, is that the patent pool's IPR pricing strategies are under direct control of the Chinese government. And it seems to be a part of the government's general policy of creating royalty free standards and an environment for the Chinese companies.

The critical divergence from the past is that the administration of the AVS Working Group has been given to the MII's Department of Science and Technology. Instead of being under CESI, the group was established in June 2002 by MII and MOST and reports directly to MII's Department of Science and Technology (Kennedy, Suttmeier and Su 2008, 17). The AVS Working Group has reportedly also diverged from the MII's old strategies after consulting international experts, and improved the conditions for international participation in the working group and the patent pool soon after this arrangement did not trigger a lot of participation (Slater 2009, 6-7).

Kennedy, Suttmeier and Su (2008, 19) have contended that the working group has benefited from the suggestions of multinational corporations, and is sufficiently detailed, balanced, and open.

It is clear that policy makers have changed their strategies for the success of the initiative after consulting with international consultants about the benefits of strategic openness and international participation.

The policy makers have also intended to promote the AVS as an international standard. The secretary of AVS industrialization association, Weiming Zhang is reported

to have said that: “the key to maintain the continuous competitiveness of AVS standards is open and merging. Open means that we need absorb good enterprises and technologies both domestic and exotic into AVS. Merging means we should have the confidence to join the international competition even dominate the formulation of international standards” (quoted in Source163 2009).

To promote the AVs as an international standard, it needs to be transparent in its proceedings and open to the participation of various stakeholders, a lesson learned from the WAPI case as examined in chapter three. In 2006, Gao Wen announced that: “If all goes well, systems using AVS will be ready for market introduction by the third or fourth quarter, with potential applications ranging from satellite and cable set-top boxes to mobile phones and high- definition optical-disk players. The next step for backers will be to take the spec to the International Organization for Standardization / International Electro-technical Commission with the hope of making AVS an internationally accepted codec” (quoted in Clendenin 2006).

STRATEGIES FOR THE PROMOTION OF THE STANDARD

From the very beginning, the future of the AVS has been uncertain, owing largely to the fact that the MPEG series standards are accepted and widely used internationally. Like in other home-made standards initiatives in China, as much as in other countries, manufacturers and consumers tend to adapt to internationally accepted standards despite possible high royalties for the embedded patents. Even five years after the start of the AVS initiative, according to a National Bureau of Asian Research Special Report (Kennedy, Suttmeier and Su 2008, 24-25), most Chinese users of codec standards have adopted the international MPEG-2 standard. Netcom, which is controlled by the government, is China's second largest wired-line operator (Clendenin, China's AVS

Codec Gains More Top-Tier Support 2007). Despite a pledge from China Netcom to use AVS in its IPTV network, it is only an exception to the broader trend. Internationally, VC-1 and MPEG4, by simplifying its licensing mechanism, have been adopted into both Blue-ray and HD DVD players, digital TV, and other technologies.

Even from casual observation of the sector in China, it is clear that the sector is hesitant about adapting to the standard. EETimes (C. Yan, China Netcom Chooses AVS over H.264 for IPTV 2006) has reported that: "AVS and H.264 are said to be about the same in terms of technical performance, but some chip makers have privately said they remain skeptical."

However, at a critical point for the future of the AVS, in 2006, China Netcom, a major wire-line telecom company in China announced to fully implement a domestically developed codec in its fledgling IPTV network. EETimes (C. Yan, China Netcom Chooses AVS over H.264 for IPTV 2006) has also reported that use of the AVS by the China Netcom is a big break for its developers, "which have had a hard time selling it to the industry. China Netcom is running IPTV trial in five cities, one of which uses AVS while the other four use the more popular H.264."

Chinese companies concern mostly that the international standard H.264 is used on a much broader scale globally and has dominated the IPTV market. "The fact that AVS is a candidate is a positive acknowledgement of the technology, but does not mean it will be widely used in or outside of China" (C. Yan, Despite ITU Nod, China IPTV Codec's Future Unclear 2006). Hence, as regards the strategies of the AVS Working Group, Wen Gao has also been reported to say that: "AVS industrialization is still in the initial stage. Although it has no competitors in China, it faces with the severe competition from other international standards. So some nation support policies would make sense.

But in the long term, the promotion of AVS should not rely on policies. It should rely on the mature and development of market" (quoted in Source 163 2009).

However, despite the reluctance of the Chinese institutions and manufacturers to use the AVS standard, many government institutions and government controlled companies have continued adapting to the standard on a gradual basis. As, similar to other standards initiatives in China, the government's support for and the adoption to the standard are not smooth processes and on many occasions slowed by the lack of coordination and disputes among different institutions or interest groups. Suttmeier, Tan and Yao (Suttmeier, Tan and Yao 2006, 34) have argued that: "defining the interest of the Chinese state in standards is by no means straightforward and unambiguous." Lack of coordination and ambiguous policies might basically reflect the organization of the Chinese bureaucracy. "The Chinese bureaucracy is not only vast and complex but also pervaded by numerous cross-allegiances and competing lines of authority. These exist across domains, such as telecommunications technology; within the same agency; between the national, regional and local layers of bureaucracy; and between the local and central braches of the same bureaucratic organization" (Bretznitz and Murphree 2011).

However, an analysis of this initiative implies that China has diverged from its early strategies and learned not to focus its efforts on a single standard and associated technologies which might fail in the market.

In 2003, the State Administration of Radio, Film, and Television (SARFT), for instance, rejected the AVS system in favor of MPEG-4, which represents a significant setback for the initiative (Kennedy, Suttmeier and Su 2008, 20). In addition to this decision by a key stakeholder in the Chinese market, in the first critical commercial test of the standard, however, in its procurement decision, SARFT backed away from the

AVS and opted for the more familiar MPEG international standard (Suttmeier, Tan and Yao 2006, 34).

In September 2006, China's second largest telecom carrier, China Telecom, and its largest telecom equipment maker, Huawei Technologies, have been reported by the EETimes (C. Yan, Despite ITU Nod, China IPTV Codec's Future Unclear 2006) to prefer the international standard H.264 over the AVS. Frank Caruso, a senior analyst at Huawei said that: “H.264 is low cost and the best option for IPTV.” Linde Zhang, vice general manager of China Telecom subsidiary Shanghai Telecom, also commented that: "For now, H.264 is a more mature a standard.” Although, some institutions announced to adapt to and use the AVS, the major players’ and the industry’s reluctance have continued over the year. “Domestic telecom companies, including China Telecom, so far seem to favor H.264. But Huang Tiejun, secretary of the AVS working group, disagreed, claiming that there is budding support for AVS” (C. Yan, Despite ITU Nod, China IPTV Codec's Future Unclear 2006).

Nevertheless, the working group has continued its efforts to develop and promote the standard. During the implementation process, by 2005, the AVS standard for video compression would become a national standard. As, the AVS standard includes four separate technical standards (systems, audio, video, and digital copyright management) (Kennedy, Suttmeier and Su 2008, 19-20).

In addition to the recognition as a national standard, the AVS Working Group has developed new and complementary versions of the standard for different products. The final drafts of the first part (systems) and sixth part (DRM) were completed in July 2007 and March 2007 respectively. The video standard was published in March 2006, targeting high definition and high quality digital broadcasting, digital storage media and other

related applications. It has also been approved by SARFT for mobile broadcasting applications. A new video standard, AVS Part 7 (AVS-M) specifically targeting mobile multimedia applications was also completed in June 2007 (Burger, et al. 2007, 6).

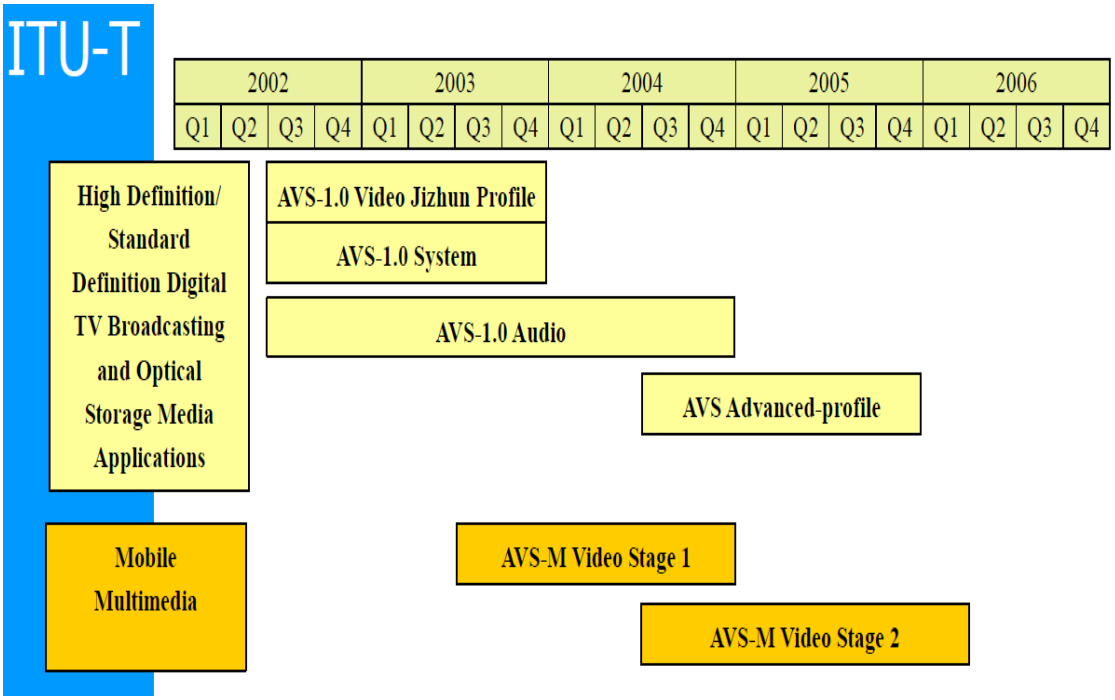

Illustration 4: Standard Structure of AVS - Video (Gao 2005).

Despite the recognition of the AVS standard as a national standard, the standard has never been mandatory. According to the WTO, voluntary standards are defined as 'standards' and mandatory standards are defined as 'technical regulations.' Yet, nothing prevents governments from promoting certain national standards through various ways. As a national standard, the AVS standard has been supported and promoted by several government institutions and companies, most notable of which is China Netcom. It has been reported that: "the development of AVS in various fields couldn't happen without the supports from nation policies. No matter AVS being confirmed to be the national

standards, or the Nation Development and Reform Commission's notice of supporting the AVS standards, government gives a lot of supports during every progress step of AVS" (Source163 2009).

Moreover, in China most of the domestic broadcasting and TV standards are recommended instead of compulsorily enforced upon service providers (Burger, et al. 2007, 2). However, those recommendations appear to be taken 'seriously.' For instance, in 2007, to accelerate the popularization of AVS standard in the ground television broadcast, the AVS Industry Association announced its strategy as: "implementation of AVS in the double national standards of ground television broadcast to comply with the nation's 'double national standards ground television broadcast system" (C. Yan, First time Chinese Government Procure AVS Products 2010). By 2010, there were 11 first tier cities in China that have deployed the AVS system. And another 13 first-tier cities are testing the system. In addition, in 2007, Chinese Set-top-box producers for the cable industry announced at least for the domestic market "to switch from MPEG-2 code to the Chinese AVS standard codec. The reason is disputes over licensing royalties for MPEG-2 standard, issued by the MPEG Licensing agency (MPEG-LA) (Burger, et al. 2007, 5).

As a national standard, public procurement and purchases of AVS compatible products seem to have supported the promotion of the standard, despite the reluctance of the sector to switch from more convenient international standards to the AVS. Promotion of the standard through the Chinese networks is also noteworthy in this respect. Yan (China Telecom to Launch AVS-based IPTV Trial 2007) has reported that: "in a market dominated by H.264, some observers believe it doesn't make much sense to switch to AVS, which may carry higher costs because of its immaturity. However, there is a sense

that political pressure rather than business sense is driving the decision. All of China's telecoms are state controlled."

An examination of the history and background of the AVS standard reveals the lack of coordination and even different views about the future of the AVS standard among government institutions in the process. In spite of that China Telecom, for instance, favors the international standard, H.264, by contrast, its rival; China Netcom is officially committed to the AVS (Clendenin, China's AVS Codec Gains More Top-Tier Support 2007). In 2007, China Netcom announced its plans to use AVS-based IPTV in 20 cities by the end of that year, and reach 6 million AVS-based IPTV users in five to seven years, or 40 percent of its current broadband users (C. Yan, China Telecom to Launch AVS-based IPTV Trial 2007). However, despite its long term refusal of the AVS standard, China Telecom started preparing to test the AVS codec in one field trial in 2007 (Clendenin, China's AVS Codec Gains More Top-Tier Support 2007).

The Support of the China Netcom for and its use of the AVS standard became decisive for many Chinese companies to adapt to the standard. ST, the leading set-top box supplier in China, announced its support for AVS in 2007. While, showing a demo of the company's standard definition AVS platform at the China Content Broadcasting Network conference in Beijing, ST's general manager for Greater China is reported to have said that: "the rules of the game have changed a bit, originally, we weren't sure how much support this would get, but now some operators are insisting that if you don't have AVS on your roadmap then they won't talk to you" (quoted in Clendenin, STMicro Backs China's AVS Codec 2007). Clendenin (Clendenin, STMicro Backs China's AVS Codec 2007) has also commented that: "expect other multinationals, such as Broadcom Corp., to quickly tip plans of their support for AVS, too. The change in attitude is caused by two

things. First, China Netcom has decided to use AVS in its IPTV rollout. Second, some vendors fear the government may increase its arm-twisting by telling companies they control to make AVS a required part of STB specs."

Moreover, in 2010, Weimin Zhang, the secretary of the AVS Industry Association announced that SARFT decided to procure AVS compatible products, marking the first public procurement of such products by Chinese government organization, which would be the milestone of the AVS's popularization (C. Yan, First time Chinese Government Procure AVS Products 2010).

In addition to the use of public procurement as a strategy to accelerate the acceptance of the standard, the Chinese policy makers have also targeted development of the AVS compatible technologies for different industries. For instance, in 2007, the China Association for Standardization announced to approve the China Digital Multimedia Broadcast Mobile TV Handset Standard, CSA158-2007, as the association standard. The new standard is based on DAB, a recommended standard of the Radio, Film and Television Department and the AVS (Burger, et al. 2007, 4).

Some Chinese companies have proceeded in developing AVS-compliant chips. With its eye on the Chinese satellite set-top-box market, the best known startup, Celestial, has developed a system-on-chip that includes a hardwired accelerator for the AVS video. Vimicro Corporation, a maker of multimedia mobile-phone chips, is also reported to support the AVS, through a software decoder running on an embedded CPU (Clendenin, Product Brief Chinese A/V Codec Rises. 2006).

Technology Domain	Technology Standard	Incorporated AV Codec in the Current Technology Generation	Incorporated AV Codec in the Next Technology Generation
Mobile Multimedia Broadcast	CMMB	H.264 (Primary)	Not Decided
		AVS	Not Decided
Terrestrial Broadcast	CTB/DTTV	MPEG – 2 (Primary)	×
		AVS	AVS
Internet Broadcast	IPTV	H.264 (Primary)	×
		AVS	AVS
High-Definition Video Disk	CBHD	H.264	×
		AVS (Primary)	AVS
Wireless Metro Area Network	McWILL		WiMAX

Table 3: Evolution of AV Codec Standards in China (China - EU Information Technology Standards Research Partnership 2010).

In 2007, both Broadcom Corp. and Conexant Systems Inc. are also reported to have worked on chips for the AVS standard and joined STMicroelectronics, which had already supported the AVS in its software, and worked on a hardware optimized version that would be ready by the fourth quarter (Clendenin, China's AVS Codec Gains More Top-Tier Support 2007). Aidan O'Rourke, a Broadcom executive in charge of IPTV products, is also reported to have said that: "in that same time period, one of Broadcom's 65-nanometer based products will include custom hardware accelerators to support AVS." A spokeswoman for Conexant also announced that: "Conexant plans to have its silicon ready for sampling by the first quarter of 2008." Texas Instruments is also reported to have been able to offer DSP-based support (Clendenin, China's AVS Codec Gains More Top-Tier Support 2007).

In 2009, Broadcom Corp announced that: "its continued collaboration with RaisingSun Digital Video Technology Co of Shanghai, China, has produced a next-generation 'all-in-one' digital television (DTV) turnkey solution that supports all Chinese broadcasting standards, including AVS, as well as Internet connectivity" (Nikkei

Electronics Asia 2009). This was the first complete DTV solution for television manufacturers in China that supports the AVS for high-definition (HD).

As of December 2007, China's Ministry of Information Industry (MII) and CNC are reported to have collaborated to drive industrial implementation of the AVS standard. They conducted trial tests on the use of AVS-IPTV for commercial purposes in Dalian, China as of 2006, "establishing a solid foundation for future IPTV developments nationally and internationally" (Nikkei Electronics Asia 2007).

The Chinese authorities apparently believe that the IPTV market has a great potential and target this market segment. In the first quarter of 2007, IPTV users in Shanghai increased to 220,000 according to a report from Analysis International (quoted in C. Yan, China Telecom to Launch AVS-based IPTV Trial 2007). It is also reported that IPTV users in China increased to 612,000 in the first quarter in 2007, driven 36 percent higher than the quarter before (C. Yan, China Telecom to Launch AVS-based IPTV Trial 2007).

The government's promotion of the AVS is not limited to the Chinese market. Recently, China has begun to promote the AVS standard in its neighbors through the Chinese government companies in the region. Thailand's International Engineering Public Company (TIEC), the China Broadcasting Corporation (CBC), and the United States' Telairity Inc. announced to work together to implement and deploy a digital video mobile broadcasting network throughout Thailand. With Telairity's assistance and supported by CBC, the IEC selected CMMB technology (PR Newswire 2011).

Chinese Broadcast Mobile TV Specification, CMMB, has also used AVS as its codec (Clendenin, STMicro Backs China's AVS Codec 2007). The CMMB technical standard is reportedly similar in concept but more advanced and cost-effective than the

European Union's DVB-H protocol. Over the last two years, CMMB has attracted many mobile phone manufacturers in China including Motorola, Samsung and Nokia, as well as major Chinese auto manufacturers, Audi, Mercedes-Benz, China FAW, and China SAIC. Over 5,000 multipoint, terminal and mobile worldwide phone models are compatible with the CMMB mobile broadcasting signal (PR Newswire 2011).

Similar to China's turning of the Beijing Olympics into a show case for many of its technologies (IPv6, etc.); the Chinese government turned 2010 Guangzhou Asia Games into a show case for the AVS. During the games, AVS 3D television broadcast was deployed in the stadium and main public areas in Guangzhou. It was the first application of 3D television based on the AVS standard in the international arena. This was the use of the AVS 3D encoder, HD (High Definition) set-top box. According to the Guangzhou Science and Technology Bureau, the deployment of AVS 3D in Guangzhou Asian Games would benefit the AVS industry in Guangzhou by about 1 billion Yuan (Audio and Video Coding Standard Workgroup of China 2010).

However, Chinese companies' attitude towards the AVS standard does not satisfy the expectations of the policy makers about the future of and the need for the AVS standard. During this process, many companies have expressed their hesitations. For instance, a spokesperson for Broadcom Corp. said that: "Broadcom Corp. would eventually develop technology for AVS, but it remains cautious at this point. LSI Logic Corp., an early mover in supporting China's optical-disk standard, is holding off. And SigmaTel Inc., a member of the AVS Working Group, is evaluating the codec but doesn't yet have plans to support a hardwired implementation of AVS, as it has for MPEG-4" (quoted in Clendenin, Product Brief Chinese A/V Codec Rises 2006).

Companies, in response, tend to target inter-operability between AVS and other competitive standards in their products, particularly H.264. For instance, in 2007, Texas Instruments and NSCC announced the delivery of the industry's first single-chip IPTV set-top box solution enabling dual decoding of AVS and H.264 to ensure interoperability between the standards. “It is an open research field though the issues at stake are mainly at the technological level due to the similarity between the two standards. Research performance optimization with focus on hardware implementation is ongoing, for both coding and decoding architecture” (Burger, et al. 2007, 6-7).

In 2008, Imagination Technologies Group, a licensor of intellectual property cores, announced that its PowerVR VXD380 video decoder supports the AVS, along with high and standard definition TV standards (Clarke 2008). Clendenin (China's AVS Codec Gains More Top-Tier Support 2007) has also reported that: “a handful of Chinese chip companies are also targeting AVS for set-top boxes. SVA Co and Beijing-based United Source Coding Co. have developed an encoder and Longjing Microelectronics Co., Grandview Semiconductor, and Celestial Semiconductor are working on decoders.” In addition, in 2008, Imagination Technologies, a leader in System-on-Chip Intellectual Property (SoC IP), announced that its new POWERVR™ VXD380 advanced video decoder would support all major HD and SD video formats, including the AVS standard (Design & Reuse 2008).

From the examination of the case, it is clear that China’s experience with the AVS has been shaped through its experience with international parties in other standards initiatives and the implementation of indigenous innovation policies developed and implemented after China’s WTO membership. However, there is not a consistent roadmap designed for the AVS. Different government institutions, perhaps different

interest groups have not reached a compromise over the AVS standard for a long time. And, the China Telecom insisted for a long time on using international standards instead of the Chinese AVS standard. In conformity with the main framework of the indigenous policies, the AVS standard has not been accepted as a mandatory standard. However, as a national standard, the government has increasingly promoted the standard through public procurement requirements and purchase by government companies.

As, many observers of the initiative have verified, development of the AVS standard has been open to foreign participation and transparent, in contrast to earlier examples by China, particularly WAPI. Even though, the AVS standard incorporates many basic patents from international standards, the companies that own these essential patents seem to have chosen to stay away from any confrontation with the Chinese government, and some of them even joined the AVS patent pool. More importantly, Chinese authorities, this time, have tried to broaden the coalition supporting the AVS standard.

However, it is not clear that China has benefited so far from the AVS standard as envisioned for by the Chinese policy makers. Many Chinese consumers have continued to prefer products that are compatible with existing international standards and still sold at reasonable prices. And, Chinese manufacturers have continued to produce goods that have inter-operability between different standards. Whether the MPEG and other international standards patent pools have decreased their royalty rates as a result of the threat of the AVS is one of the important questions for further research.

In a report issued in 2007, market researcher iSuppli has noted that AVS would coexist with H.264 in the Chinese market. Whereas, H.264 would be the dominant standard in the long run, capturing about 60 percent of the IPTV market by 2011 (cited in

Clendenin, China's AVS Codec Gains More Top-Tier Support 2007). This situation poses more questions about the success of the Chinese government in creating royalty free standards for the Chinese manufacture. Those manufacturers seem to use both of the standards at the same time through ensuring inter-operability.

Chapter 5: Comparative Analysis of the WAPI and AVS Cases in Retrospect

"Chinese autocracy is a learning autocracy"

Thomas Friedman (2011)

China's indigenous innovation policies aim at using China's superior market power to convince or allegedly coerce foreign companies to transfer and license their latest technology to Chinese companies. Chinese government has mandated to replace core foreign technology in critical infrastructure, such as chips, software and communications hardware, with Chinese technology within a decade. According to Macgregor (Time to Rethink U.S.- China Trade Relations 2010) the tools to accomplish this include: "a foreign-focused anti-monopoly law, mandatory technology transfers, compulsory technology licensing, rigged Chinese standards and testing rules, local content requirements, mandates to reveal encryption codes, excessive disclosure for scientific permits and technology patents, discriminatory government procurement policies, and the continued failure to adequately protect intellectual property rights."

Both the WAPI and AVS standards initiatives, therefore, should be assessed under light of the China's indigenous innovation policies and the policy framework of China's WTO membership.

Under strong international pressure, the forces underlying the implementation of indigenous innovation policies in China seem to have crystallized in the classic example of the WAPI standard. From the examination of the WAPI case and observation of the AVS case, it can be observed clearly that China's WTO membership and the hardship it

has faced since then, as exemplified best by the WAPI standard, have not led to a leading edge change in the Chinese policies.

However, strategies and approaches to achieve these policies have continued to change and evolve. Some of these strategies are not novel either in China or in other East Asian countries; they seem to have a new strategic value and to be a part of a new set of policy strategies in this framework.

In this context, the Chinese government seems to be committed to the development of Chinese home-made standards to achieve some of the objectives of the indigenous innovation policies. However, there is both a diversity of interests within the state regarding particular standards and a diversity of policy tools (such as regulation, procurement, and research and development support) that can be employed in the implementation and promotion of these standards (Suttmeier, Tan and Yao 2006, 34).

In trying to explain the variation in strategies, Suttmeier and Yao (Suttmeier and Xiangkui 2004, 43) have contended that attention to standards, and a new appreciation for the power of procurement in advancing technologies, seems to be a response to China's WTO accession. "In execution, some of the standards-based policies could be construed as inconsistent with the spirit of WTO agreements and as narrowly protectionist measures implemented by a strongly techno-nationalist regime." According to the United States Information Technology Office (2010, 11): "China seeks to foster the domestic development of innovative technologies and IPR in part through technology mandates or promotion of unique national standards. This policy is also implemented through direct or indirect interference by Chinese authorities in licensing negotiations between Chinese and foreign technology companies."

This chapter examines the change in the policy strategies of China through a comparison of the WAPI standard initiative's initial perspective, particularly before official declaration of the indigenous innovation policies, and the AVS initiative. This report assumes that the AVS case presents a beneficial opportunity to analyze the Chinese policies and the pattern of the change through China's WTO membership and the release of the Indigenous Innovation Policy Paper.

In this new era, majority of the non-tariff barriers set by China were eliminated on paper (Macgregor, Time to Rethink U.S.- China Trade Relations 2010). Moreover, as observed in the strategy change in the WAPI standard and in the AVS working group and the patent pool, the government has expanded its cooperation with foreign companies and apparently encouraged their participation in these initiatives. WAPI's mandatory nature has also left its place to non-mandatory 'national standards strategy' which is promoted through public procurement and purchases of government companies and government controlled institutions. It is clear that the new set of strategies is more complicated than the early WAPI standard initiative's mandatory and close nature, which triggered international reaction against the WAPI standard.

As discussed later, one other factor that stands out from the examinations of these cases is the concern for the IPR incorporated into standards. These strategies are no way unique to China's WTO membership era; however, they have become more significant, given the international legal restrictions and sensitivities. Through various strategies, Chinese authorities have tried to create a royalty free environment for the Chinese manufacture and institutions by incorporating them into the Chinese standards. In the AVS case, China seems also to have learned a valuable lesson from the WAPI initiative, and kept the setting of the standard and its codes transparent and open to foreign

participation. According to some, by encouraging and even 'coercing' foreign participation, China tries to acquire foreign patents through incorporating them into these Chinese standards which are arguably not so different from international standards.

Chinese policy makers encountered an outrageous reaction against the way the WAPI standard was set and introduced to the outside world. However, they have explored the limits of their policy options in this new era by trial and error, and started to focus on staying away from direct confrontations with the foreign governments or through the WTO dispute settlement mechanism. The WAPI's encryption codes have also been opened to both domestic and foreign companies, owing largely to the international criticism against the initial practice. Even before this outcome, Suttmeier and Yao (2004, 43-44) have predicted that: "even in the hotly contested WAPI case, the forces of globalization are likely to temper the techno-nationalist inspirations behind the standard, yielding an outcome which is likely to reflect elements of both conflict and cooperation."

According to Macgregor (2010) China has long been a 'pay-to-play' market for foreigners, with mandated joint ventures in key industries, local manufacturing requirements and forced technology transfers as the price of market admission. China's WTO accession in 2001 was believed remove the bulk of those barriers. However, arguably, China still plays the same policy game with new instruments, by showing necessary flexibility in its strategies.

As summarized from the examination of these two cases, these key strategies and approaches are hardly unique to either of the cases. However, they tell much about the ways that China's home-made standards are promoted and adapted, foreign technologies

are acquired, within the framework of the forces underlying China's WTO membership era.

Some of these strategies are noteworthy in that they were used by Japan as non-tariff barriers in an early period, and then Taiwan to acquire foreign technology, two of the East Asian countries that China allegedly drew inspiration. The Japanese case is well documented; Japan used its national standards to protect its domestic market effectively until it faced considerable international pressure during the GATT negotiations. Standards are still used by many countries as a non-tariff barrier to international trade. However, these policies have become harder to implement, especially at import controls, by the WTO countries. Nevertheless, most of the China's strategies are not novel; they are implemented within the new framework of the WTO and attract more international attention than other countries due to the size of the Chinese economy.

This is in part why a closer look at China's strategies and approaches in these two cases is critical to understand the "learning autocracy" (Friedman 2011). As explored in chapter four, the AVS standard apparently resembles the international standards and has perhaps incorporated many of patents in these standards. The WAPI standard, whereas, arguably includes many common features with the international standards, owing largely to the incorporated technologies, despite the fact that, at the beginning, the encryption codes of the WAPI standard were not revealed to the foreign companies. In this regard, our first question is how the foreign IP is acquired and why foreign patent holders have not objected to the improper use of their IPR.

Indicators	WAPI (Before Change in Strategies)	AVS
Goals	Royalty Costs, encryption security and protection of the market are main motivators.	Royalty Costs and protection of the market are main motivators.
Openness to Participation	Closed Encryption Codes	Open Standard setting process and standard
Mandatory/Voluntary Standard	Mandatory Standard	Voluntary National Standard
Method for Promotion	Binding for all sectors	Promotion of the standard through public procurement and efforts of government companies
Foreign Patents	Incorporated foreign patents – not certain-	Incorporated foreign patents
Tensions with Foreign Patent Holders	Likely to raise tensions with foreign patent holders	Foreign companies voluntarily dismantle their IPR through participating into the patent pool for various reasons Reliance on weak and uneven IPR protection Use of Anti-trust law and court decisions about standards and IPR
International Standard Setting	International standard proposal rejected	Become an International standard
Compliance to International Law	Use of standards and conformity assessment processes violating the WTO	As an international standard, in compliance with the WTO
International Dispute	Likely to be subject to a panel at the WTO Created international tension	Patent holders' 'voluntarily' silence on the issue is unlikely to create tension with the WTO appellate body.
Stakeholders	A small group of government institutions	A broad coalition with various stakeholders of government institutions and foreign companies

Table 4: Comparison of WAPI and AVS Initiatives.

At this point, one of the explanations is that these strategies are closely related to the general IPR regime of China, which generally provides weak or thin protection. And

it is a strategic component of the country's indigenous innovation policies. The key point for the first question lies in the IPR environment of China and various forms of IPR approaches under the indigenous innovation policies. For instance, according to a USITC report (2010):

Some industry representatives have argued that Chinese standards-setting bodies frequently take an existing standard and change the technology only slightly, just enough to add costs and make it more difficult for foreign manufacturers trying to sell their products in China. To the extent that Chinese-developed standards include indigenous IP, they also reduce the royalties that Chinese firms must pay to foreign firms whose technology often forms a critical component of the global standard.

The second question of this chapter is how the Chinese policy makers try to promote the AVS standard without enforcing mandatory rules. The key strategy here is that some of the major public institutions and government companies have adapted the standard and used it in their procurements or purchases, promoting the standard through its network affects in various inter-related sectors.

PUBLIC PROCUREMENT AND JOINT VENTURES STRATEGIES

In a report by the European Union's IPR SME Help Desk (Technology Transfer to China, Guidance for Business 2008) foreign companies are warned that they might be forced to enter into joint ventures with Chinese companies for access to the Chinese market in some designated sectors: "Approval to form a joint venture or to operate may depend on the supply of specific technology, including future improvements of this technology. In some cases, the partner cannot be freely chosen and may be a competitor or concurrent Joint Venture partner of another competitor. In other cases, the enlargement

of a pre-existing investment may require the set-up of a local R&D Centre or other forms of transfer of know-how."

In addition to specific rules about bidding requirements of technology transfer, China's market size is often used as a justification in the bidding process to give the contract to whichever company promises the greatest transfer of know-how. In addition, "Chinese Government specifically selects certain industrial sectors in which technology transfer strategies, localization and reduction of reliance on imports are to be implemented (EU China IPR SME Help Desk 2008)."

In those technologically critical sectors, the government never allows foreign direct investment out of its control. Forming a joint venture with a Chinese partner, in many cases, is the only way to access many sectors. Even when the foreign partner's investment is over fifty per cent of the venture, the government finds a way to control the establishment. For instance, even after 3Com's, a major international internet company, buying of a 49% stake of the joint venture, Huawei-3Com, which had been held by Huawei, many still believe that the joint venture is still controlled by the government, despite the fact that Huawei-3Com has thus become a wholly owned foreign enterprise.

Only a few foreign companies have chosen not to compromise with the Chinese government and refrain from these kinds of partnerships despite the risk of getting swept from the Chinese market. Ericsson Communication Software Research and Development (Shanghai) Co. Ltd. (RDC) case sets an example of this. The Chinese government reportedly exerted pressure on Ericsson to form a joint venture. However, Ericsson chose not to do so, since the Chinese company would likely compete with Ericsson in Ericsson's global technology activities, if it shared proprietary technologies and the intellectual property (Dadgson, Kastelle and Mathews 2006, 95).

However, this is an exception to the rule and joint ventures are the only way for many foreign companies to enter the Chinese market, particularly the growing public procurement market. It is remarkable that public procurement is also used as a multi-purpose strategy tool by the authorities. Suttmeier and Yao (2004, 36) have maintained that: "at a time when WTO obligations are constraining China's use of older instruments of industrial policy, being formally unconstrained in the procurement area provides an attractive tool for the state to pursue its technological priorities." The U.S. - China Business Council (2010, 22) has also reported that: "the primary and most explicit benefit conferred upon products that receive indigenous innovation recognition is preference in government procurement."

In 1998, the Chinese public procurement market amounts to 3.1 billion Yuan, accounting for a mere 0.04 percent of GDP or 0.29 percent of government expenditure. The size of the public procurement market has grown rapidly since then, reaching 101 billion Yuan (roughly US$12 billion) in 2002, amounting to 9.64 percent of GDP or 4.58 percent of government spending (Suttmeier and Xiangkui 2004, 36). The USITC (2010, 5-9) has also reported that this market for goods and services was estimated to be $88 billion per year in 2008, equal to 2 percent of China's GDP and making up almost 10 percent of Chinese government expenditures. This figure, moreover, does not include significant levels of public investment in infrastructure projects. In 2010, the American Chamber of Commerce in China estimated that public works projects accounted for at least 50 percent of total Chinese government procurement funding, and the total annual value of government procurement contracts accounted for almost $200 billion (cited in the USITC, 2010, 5-9).

Despite these astonishing figures, some observers of the Chinese public procurement market claim that the actual size is even larger. The U.S. - China Business Council (2010, 22) has attributed this claim to that schools, hospitals, museums, state owned enterprises, and other public entities are subject to varying degrees of influence from central and local governments.

Several US companies have reported: "increasing difficulty in making sales to government-related entities in China, including government agencies, public institutions such as schools and hospitals, and SOEs [State Owned Enterprises]" (cited in the USITC, 2010, 5-9). The environment for foreign companies in China's government procurement market is reportedly deteriorating.

In addition to granting priority in government procurement to the products produced with domestic technologies, government strategies award indigenous innovation products with other kinds of special treatment. For instance, the 'Selected Supporting Policies for the 2006-20 Medium and Long-Term Science and Technology Development Plan (2006)' also favors indigenous innovation products in price-based bidding processes (The U.S. - China Business Council 2010, 22).

Even though in some sectors, government owned establishments are not required to abide by government's procurement regulations, they are reported to implicitly honor regulations that establish preferences for Chinese companies (USITC, 2010, 5-9). In this regard, the mandate in Article 20 of the National IP Strategy issued to all government institutions is also noteworthy: "Properly balance the relationship between patent protection and public interest. While protecting patents, perfect compulsory licensing system, give play to exception system, study and make reasonable policies, insure access

to essential products and services timely and sufficiently in case of a public crisis" (quoted in Slater, 2009, 8).

Another policy instrument for public procurement is the public procurement catalogs used by the local governments. However, as of September 2010, there is not any central government catalogue for indigenous innovation products; ten provincial and municipal governments released 25 publicly available catalogues identifying indigenous innovation products between 2006 and 2010. Eight additional provincial and municipal governments have also formulated indigenous innovation catalogues. The provincial catalogues list the preferred products for government and government owned enterprise procurement and purchase. These catalogs do not include any products made by foreign companies, effectively excluding foreign companies from provincial government procurement markets unless there is no Chinese-made alternative to a foreign product. Furthermore, "some observers view these as 'trial balloons' for the central government's expected catalogue" (USITC, 2010, 5-12).

Furthermore, lax enforcement of the law and government regulations and the non-transparent network of relations of government institutions and companies appear to contribute to these strategies. "Government entities and corporations are giving contracts to specific companies. China is a huge market and a lot of companies have interest to be there" (The Telecommunications Industry Association, pers. comm., 11/11/2010).

Foreign countries view some of these Chinese firms with suspicion because of their close ties with the Chinese government. Some believe that they try to access foreign technology under government direction. Shah (2010) wrote that:

Huawei was founded by former Chinese army officers while ZTE too has close relations with the administration. This frequently puts them at a disadvantage while

bidding for non-Chinese projects. Huawei and ZTE were banned by the Indian government due to security concerns. USA has also put obstacles over Huawei acquiring telecom equipment maker 3Com.While USA does not want these 2 firms to acquire state of the art technology, India does not wish them Chinese firms to be involved in building critical communications infrastructure. While both firms have tried to assuage concerns, it has not managed to convince the governments in these countries as of now…Huawei has managed to become the 2nd largest telecom equipment producer in a short span of 10 years by overtaking stalwarts like Motorola, Nokia Siemens and others. This has naturally led to allegations of technology pilfering and stealing of trade secrets. Cisco had earlier filed a case against Huawei which was later settled. Now Motorola has filed a case in the USA accusing the top management of Huawei of knowingly being involved in the theft of proprietary Motorola information.

From an observation of these practices, it is clear that, in addition to the special treatment of domestic technologies under the indigenous innovation policies, public procurement strategies serve to the promotion of the Chinese standards, throughout its launch and promotion of the AVS and later of the WAPI standards, when they are adapted as 'national standards.'

In retrospect, participation of the foreign companies in the AVS Working Group and the patent pool is inextricably linked to these strategies examined above and the IPR environment where co-operation and technology sharing with the government is to the benefit of foreign companies. Yet, most of the time, there is not any reported direct action by the government against foreign companies. The Telecommunications Industry Association (pers. comm., 11/16/2010), for instance, has reported that there is not any

complaint about forced patent pool participation or IP licensing in China to the association.

These companies merely find it in their own interests to be the partners of the government in such joint initiatives or not raising their complaints. Texas Instruments, for instance, indicated its intention to support the WAPI standard and its general manager for Asia, Cheng Tianzong has been reported to say that: "it was reasonable for China to make its own standards in light of its national security concerns and that, furthermore, Texas Instruments needs the Chinese market and wants to cooperate with Chinese enterprises (quoted in Suttmeier and Yao, 2004, 30)." Texas Instruments also supports the AVS standard and has joined the patent pool.

JUNK PATENTS AND COMPULSORY LICENSING PROVISIONS

China's accession to the WTO has paved the way for a new era both for China and the world economy. Since then, China has increased the level of IPR protection and extended it to many product groups which had been excluded from IPR protection. Macgregor (n.d., 26-27) has reported that:

China's original March 1984 patent law was amended several times to bring it into closer alignment with international standards. A group of 1992 amendments added food, pharmaceutical and chemical products as eligible items for patents. They also extended "invention" patent rights to 20 from 15 years, and "utility" patent rights to 10 years from five years. In 1994, China joined the International Patent Cooperation Treaty (PCT), and the Chinese patent office was qualified to receive and process international patent applications. In 2000, China's patent law was amended to try to bring it into compliance with the WTO agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS).

However, despite the extension and strengthening of IPR legally, some observers claim that use of junk patents is widespread to circumvent the claims of foreign patent owners and silence them for their infringed IPR in 'indigenous technologies' or 'Chinese standards.' And, the threat of suing foreign companies that own some of the essential patents for China for infringing 'the Chinese patents' help the policy makers silence the foreign companies. The lax enforcement of IPR and the justice system that is clearly open to government intervention seem to have contributed to development of this environment and created a blurred legal base for many foreign companies.

One of the policy instruments that might have been used by the Chinese government in the AVS case is junk patents. By using this policy instrument, China implicitly threatens foreign companies that dare to confront Chinese companies with patent infringement law suits in other countries with their existence in China. In 2009, Chinese nationals accounted for 877,611, or nearly 90 percent, of 976,686 patent applications in China. 230,000 of these patents were 'invention' patents which require detailed information and undergo detailed review. Utility patents' number was 308,861. Design patents totaled 339,654. So nearly three-quarters of Chinese patent filings were in the 'junk' category (Macgregor n.d., 26-27).

In a case reported by Macgregor (27):

In September 2007, just three months before the list of 16 indigenous innovation megaprojects was unveiled…the Intermediate People's Court in the coastal city of Wenzhou ordered the French electronics giant Schneider Electric to pay the Chint Group of Wenzhou RMB 334.8 million (about US $50 million) in damages for infringement of Chint's China 'utility model' patent. This unprecedented penalty, 17 times higher than any previous IPR award in China, was undoubtedly approved at high Party levels as the

Chint - Schneider dispute had been elevated to bilateral discussions as high as French President Nicolas Sarkozy and President Hu.

According to Macgregor (27), 'junk patents' prove to be a powerful weapon against foreign companies. It was "a perfect case for China to use as a warning to multinationals who believe they will be able to sue Chinese companies for IPR infringement outside of China while continuing to operate unimpeded in the Chinese market." Although there have not been any reported compulsory licensing cases, compulsory licensing provisions has been expanded. For instance, when a patent holder does not 'sufficiently exploited the patent without any justified reason' within three years of approval, or when a court or administrative organization has determined that the patent is not being used in order to eliminate or restrict competition, with the new provisions Chinese authorities might force foreign companies to license technology in China.

These new provisions about the implementation of IPR appear to be justifying the actions of the government in the eyes of the foreign patent holders, even though the government might not need to adhere to using them. Chinese government officials might have developed these initiatives to test the limitations of traditional compulsory licensing (Slater 2009, 1).

Slater (2009, 4) has also raised the question of whether the remaining gaps between China's patent law and the WTO TRIPS compulsory licensing safeguards are intentional, a lack of understanding, errors in translation, or a combination of the above. "It will not be certain until the compulsory license provisions in the Third Amendment are tested through implementing rules and actual patent licensing cases" (1).

UNEVEN AND LAX IPR PROTECTION

Although, IPR protection is uneven and open to arbitrary decisions by the authorities, it is not clear that uneven and lax IPR protection is deliberately forged upon foreign companies by the Chinese government to acquire foreign technology. On many occasions, however, government authorities do not hesitate to take advantage of weak IPR protection. According to a foreign lawyer working in China (pers. comm., 2/16/2011): "Chinese judicial system is almost controlled by the government and open to arbitrariness. Foreign companies know that risk of investing in China; companies know that they eventually have to deal with the government. Foreign companies cannot count on the judicial system, but have to deal with the government authorities."

As examined in the previous sections about the use of junk patents and foreign patents' incorporation into the Chinese home-made standards, the government authorities have also the legal means to use these strategies. Even the existing legal protections and practices compromise an area that is open to arbitrariness and the government authorities do not hesitate to use in their advantage. Nonetheless, it is not possible to clearly verify that the problems in the judicial system are related to a certain IP or standards policy, it is arguably a common trait of the judiciary. Historically, Chinese legal system was not independent from the state and supreme. Furthermore, many government agencies are closely involved in business affairs and local governmental agencies have powers to interpret regulations, issue licenses and impose taxes. This furnishes ample scope for negotiations and corruption within the system (Dolles and Wilmking 2005, 9-10).

Although, China has introduced many legislative changes to strengthen the IPR regime and protection, the current system still suffers from such uncertainty. The interpretation of agreements can depend on the influence or autonomy that the Chinese

partner enjoys with higher authorities. The signing of a formal contract does not guarantee certainty or even the conclusion of negotiation (Child 1998, 256).

In addition to the holes in the laws, lax enforcement and uneven protection stand out as the causes of foreign companies' reluctance to open patent infringement suits. According to the 2005 position paper of the European Union Chamber of Commerce in China: "while multinationals have been criticizing the weak IPR protection in China with one voice, they rarely initiate infringement litigations, whether through judicial means or administrative channels" (as cited in Liang and Xue 2010, 481). Furthermore, the judicial procedure about infringement is costly and complicated, and the administrative enforcement mechanism is often weak. Many observers of the system believe that many IPR infringement cases are not filed in courts (Liang and Xue 2010, 481-482).

In addition to the weaknesses in the IPR system, incorporation of patents into the standards gives the government another leverage to circumvent the IPR protection. Although, the national standard-setting authorities in China have not yet established public disclosure and use rules of patents in relevant standards, if a patentee engages in the setting of a standard or agrees to the patent's incorporation into a standard, the patentee is considered to have licensed the patent while implementing the standard by law. As, the use or exploitation by other people of the patent does not constitute patent infringement provided by Article 11 of the Patent Law (Slater 2009, 7). In other words, entry into the AVS patent pool and other standards initiatives is a key step towards dismantling associated IPR.

The critical question here is whether China deliberately enforces uneven and lax IPR protection, and even it does so, whether such policy strategies violate the WTO rules or principles. Patricia Hansen, for instance, said that: "it can be said that laws adopted by

China undermine effective enforcement of patent rights. Also, uneven protection is impeaching the WTO principles." However, she added that: "it is not a strong argument and mostly depends on the technical capacity of the host countries" (pers. comm., 2/22/2011).

On the other hand, as regards the compulsory licensing provisions of the Chinese IPR law, Patricia Hansen has also argued that China's compulsory licensing provisions which are arguably in conformity with the WTO rules are without a strong theoretical basis: "WTO panels interpret TRIPS exceptions very narrowly, even for the developing countries. That's why governments don't want to go to the WTO dispute settlement mechanism. The question is if you really need to get a compulsory license" (pers. comm., 2/22/2011). Moreover, these exceptions do not allow China or any other developing nation to export products which have been produced with foreign technologies acquired through compulsory licensing, to other countries.

DISCLOSURE OF TECHNOLOGY SECRETS

Another common trait of China's IPR regime, which poses a problem for the foreign enterprises, is the weaknesses in the protection of commercial and technological trade secrets. This weakness is also burdened by the Anti-trust law provisions which require revealing of technological trade secrets to the Chinese authorities before authorities allow foreign companies to operate in China.

One of the experts on the Chinese business practices (pers. comm., 2/16/2011) said that: "foreign companies have to file their application for a license before the Commerce Department before starting their operations under the Anti-trust law, and report to the authorities." As a requirement, companies are often obliged to reveal their technology secrets to the authorities in order to acquire a license for operation.

In addition to the requirements of the Anti-trust law, for many projects, in particular the manufacture of machinery and equipment, Chinese authorities require review of industrial drawings and designs by Chinese design institutes. Moreover, many foreign companies are required to train Chinese staff during these projects. The EU China IPR SME Held Desk (2008) has asserted that: "these drawings and know-how may later be used by other Chinese projects which wish to duplicate and use the design in other locations of China."

CHANGING ATTITUTES AND COALITION BUILDING

Recently, China has been reported to water down its rules that sales to the government must go hand-in-hand with technology transfer (Areddy, China as Co-Shaper of Global Standards 2010). As regards the public procurement regime, however, the increasing vocal criticism of the system by the chieftains of companies like General Electric Co., BASF SE and Siemens AG, as well as surveys, signify that these policies have not gone away.

Countries and multi-national companies have become more critical about China‘s methods to extract foreign technology and to support Chinese standards.

Although, foreign businesses usually avoid talking openly about problems they have in China and backroom negotiation is preferred and press attention typically not welcome, many foreign companies have become more outspoken against these practices. In 2010, General Electric (GE) CEO Jeffrey Immelt reportedly expressed concerns about the uncertainty as to whether China wanted companies to be successful in the Chinese market. Furthermore, Jurgen Hambrecht, chairman of BASF, and Peter Loescher, chief executive of Siemens, both complained about the need to transfer technology to Chinese partners for deals to go ahead, obstructions put up against them in getting access to the

Chinese domestic market, and intellectual property violations, when they met Premier Wen Jiabao, alongside German Chancellor Angela Merkel (Oxford Analytica 2010). According to a report by Deutsche Presse – Agentur, Jürgen Hambrecht complained that: "foreign companies faced 'forced disclosure of know-how' in order to do business in China. That does not exactly correspond to our views of a partnership" (quoted in Areddy, Germany's BASF: China Critic, Investor 2010).

One of the important lessons of the WAPI case for China is that a direct confrontation with foreign governments and multi-national companies will create obstacles to the implementation of mainstream policies of the Chinese government. Although, the WAPI case has not been brought to the WTO dispute settling mechanism, the US government used enforcement of Article 301 as a threat against China on many occasions. This signifies that multi-national companies still have teeth to use against China even in the cases that the Chinese policies do not infringe any IPR or it is hard to prove violation of international trade laws.

It is also admissible to evaluate the AVS case under this assumption. Here, China tries to convince foreign companies to enter the AVS Working Group and the associated patent pool through a combination of soft and hard-line approaches. The companies behind 'failed' standards developed elsewhere, such as TD-CDMA and HD-DVD, have become active supporters of the AVS standard. They provided access to platforms and technologies developed and standardized in the global arena. The size of the Chinese market justifies their actions, even if they may object to some of the terms (China - EU Information Technology Standards Research Partnership 2010, 16). As discussed in the previous chapters, attractiveness of the Chinese market, along with the Chinese

government's IPR regime and informal strategies appear to be the underlying reasons for the foreign companies' decisions to cooperate with the government in these initiatives.

The indigenous innovation policies and relevant strategies set the context in which foreign companies enter the AVS Working Group and join the patent pool, and/or keep their silence for their patents' incorporation into Chinese standards and the use of the Chinese standards that are not in conformity with the relevant international standards.

Cliff Reader has also highlighted that he has encouraged foreign companies to enter the AVS Working Group and join the patent pool to be a part of the process: "We have urged foreign companies to join the AVS patent pool, but it has been the decision of the foreign company whether to do so (Some have not)" (pers. comm., 2/22/2011). He has also emphasized the government's careful strategy of observing the WTO rules and learning from other countries: "China has been very careful to observe WTO rules - possibly to a fault. The government has urged adoption of AVS, but has not mandated it, even though it is a National Standard. I pointed out to the Chinese government that the FCC in the US mandated all TVs sold in the US have ATSC tuners. My colleagues were worried China could not mandate AVS decoders in TVs under WTO rules" (pers. comm., 2/22/2011).

As observed in the AVS case, the most troubling issue for the Chinese policy makers appears to build and support a coalition in government circles to support these initiatives. However, even such support is provided, tensions between Ministries can continue to undermine the transparency of implementation, even when formal standards making procedures have been followed (China - EU Information Technology Standards Research Partnership 2010, 16).

In this context, given the mistakes of the WAPI initiative and the new rules of the WTO era, the Chinese strategists have envisioned a new strategy. China has increased its participation in the international standards setting bodies. Although, China has been a member of the ITU for almost a century, China has only recently increased its participation into the union. Between 2008 and 2009, the number of delegates from sector member organizations participating in ITU-T Study Group meetings increased from 79 to 172. Contributions by Chinese Sector Members and Administration grew six fold, from 97 in 2006 to 583 in 2009. More importantly, China's contribution has increased by nominating more representatives to serve as study group chairs, vice chairs, reporters etc. Moreover, some successful Chinese multinationals, such as Huawei and ZTE have started to play an increasing role in international standard setting activities, for instance, by sending representatives to international standardization organizations and taking on positions of responsibility. It is also noteworthy that experts from two competing standards initiatives, that of the MPEG4/H.264 and the AVS, are reported to jointly work on the future generations of international codec standards (China - EU Information Technology Standards Research Partnership 2010, 18).

Rank	Country	Participatory Members	Observant Members	Host Secretariat
15	**China**	**176**	**0**	**5**
24	Finland	140	35	1
25	France	164	12	24
27	Germany	175	1	34
37	Italy	165	11	13
38	Japan	173	2	24
42	South Korea	144	29	4
52	Netherlands	121	37	3
63	Russia	149	19	2
72	Sweden	140	35	6
73	Switzerland	121	22	4
80	United Kingdom	170	5	19
81	United States	160	0	25

Table 5: China's Participation in the IEC (International Electrotechnical Commission 2011).

Although, it is not certain that growing Chinese participation and presence in these organizations have the potential to change the balance of power in international standards setting, this gives China the leverage to block recognition of international standards that are in conflict with Chinese interests.

Despite the WAPI's initially closed encryption codes, as in the case of AVS, China has started to rely more on international recognition of Chinese standards by submitting their drafts to the attention of other countries through international standardization organizations to get feedback from them. However, the overall impression is that it is still not clear whether China really uses this kind of feedback from the international community in its standards setting activities or merely pretends to be playing the game with the rules.

Chapter 6: Conclusion

According to Dadgson, Kastelle and Mathews (2006, 96), the traditional strength of East Asian technological capabilities lays at the diffusion of existing, rather than creation of new technologies. Asia is still highly reliant on science and technology created elsewhere. Hence, when analyzing the technology policies of these countries, acquisition of foreign technologies stands out as the critical element.

In evaluating the Chinese policies or strategies for home-made standards initiatives, it is instructive to take this perspective into account. In light of this perspective, this report has sought to study a particular aspect of the change in China's technology policy strategies by examining the two major Chinese standards initiatives within the framework of China's WTO membership.

Suttmeier, Tan and Yao (2006, 43) have argued that China has benefited little from its home-made standards, even though some of them have been approved as international standards: "Chinese industry has not collected any royalties from these standards, cross licensing of standards between Chinese and foreign companies has yet to occur, foreign firms have not turned over their intellectual property as a result of these standards, and products based upon these standards have met with only limited commercial success." According to Kennedy, Suttmeier and Su (2008, 32): "expectations that China's sheer size could provide sufficient leverage to have its standards widely accepted have so far proven unfounded."

However, as explored in greater detail in the previous chapters, it is clear from the observations of the WAPI and AVS cases that China is still heading to its pre-determined goals; protection of the domestic market with Chinese standards as non-tariff barriers,

development of royalty free environment for Chinese manufacture through standards, and as a last remark acceptance of Chinese standards internationally. China is trying to achieve these goals within an international framework set by the WTO regime and increasing international scrutiny.

However, Chinese policy makers do not appear to have a clear goal for the Chinese industry to collect royalties for the patents incorporated into the Chinese standards. As, such a strategy would contradict with the primary goal of circumventing royalty requirements of international standards and promoting Chinese standards internationally through providing them without any charge. They basically seem to hope to benefit from increasing sales of Chinese products all over the world through international acceptance of Chinese standards.

Many still believe in the future success of Chinese standards in the global economy. Linden (2003, 15), for instance, has argued that: "China's large market allows its policymakers both the scope to pursue local standards and the luxury to let the standards find their own way in a semi-closed market. In a smaller economy, the dominance of international standards would be assured, but in the large China market, complicated by its vast size and a bewildering variety of local regulatory regimes, locally developed standards have a real chance to flourish domestically and then perhaps to be exported."

However, in discussing the AVS initiative, Cliff Reader has stated that he does not expect the AVS 1.0 standard to be adopted by any other country or international standards setting body, though: "satellite knows no boundaries and Chinese-speaking people in other countries will receive AVS broadcasts" (pers. comm., 2/22/2011). Nevertheless, as some experts have maintained, Chinese standards might still serve to

various sectors, by providing royalty free alternatives to dominant international standards. Cliff Reader has perceived a potential for the AVS standard in this regard: “AVS 2.0 is in design now, and is the leading candidate for MPEG's new royalty-free codec work” (pers. comm., 2/22/2011).

From the examination of both of the cases, it stands out that China focuses its efforts on getting the consent of foreign companies and ensuring their participation to stay away from a direct confrontation with foreign governments and disputes under the international trade law. As discussed in previous chapters in greater detail, government companies or government controlled companies do not hesitate to establish joint ventures with foreign companies to access to foreign technology and make it available to serve the development of Chinese standards. Moreover, this strategy is also supported by foreign companies’ interest for the well protected Chinese market, specifically the large government procurement market. Several foreign companies have established joint ventures with domestic companies to gain or keep access to the Chinese market, which might have taken a compulsory form.

For Chinese authorities, industrial growth through exporting manufactured goods to outside world is clearly not enough. They want to develop China’s science and technology capacity and own the key technologies for the success of Chinese industries. They want foreign companies, either through joint partnerships or various formal and informal ways to share their technologies at very low licensing fees. In this sense, they also show no tolerance to the private sector over their licensing strategies. These efforts seem to be well planned, as they target certain technologies and particular companies (The Telecommunications Industry Association, pers. comm., 11/13/2010).

Another important observation of Chinese policies and strategies concerning Chinese standards is that China's efforts to acquire foreign technologies are not always in conformity with the WTO rules or principles. However, China's new strategies give the country the leverage to make it harder for the foreign stakeholders to prove that they violate the WTO rules. Patricia Hansen asserted that: "[for foreign technology in exchange for contracts for public procurement,] I don't think this is an infringement of the TRIPS Agreement. You can't say people that they cannot waive their rights. In return, they are arguably compensated for access to the public procurement market" (pers. comm., 2/22/2011).

However, the critical question here is with this new set of strategies, if China promotes the AVS and WAPI standards, which are not mandatory unlike the early WAPI initiative, through employing informal strategies. In this sense, the decision of the 'Japan-Trade in Semi Conductors Panel' would shed light on legality of Chinese strategies from an international perspective.

In discussing the 'Japan-Trade in Semi Conductors Panel,' for instance, Patricia Hansen has argued that: "there were insufficient incentives for the private [Japanese semiconductor] companies and the compliance of private actors are essentially dependent upon the government, at least arguably it cannot be said to be in conformity with the GATT principles" (pers. comm., 2/22/2011).

In this specific case, the European Community has claimed that the MITI was pressuring Japanese manufacturers through administrative guidance to restrict overall export volumes of certain semi-conductors, resulting in severe reduction of supplies, delays in the granting of export licenses and other disruptions. Japan's goal was to aid the US efforts to satisfy Japan's obligations under an arrangement. In fact, it was reported

that: "the MITI Minister had convened an emergency meeting with the Chairman or President of each of the ten major semi-conductor companies to impress upon them the importance of avoiding dumping in third country markets" (WTO 1988, 9).

At this panel, Japan defended its policies on the grounds that: "none of the measures was legally binding, and the Japanese society was not so feudalistic that non-binding requests by government would be accepted readily and administrative guidance by MITI did not always work" (11).

However, at the end of the hearings, the Panel noted that: "the practice of 'administrative guidance' played an important role in the enforcement of the Japanese supply restrictions, that this practice was 'a traditional tool of Japanese government policy based on consensus and peer pressure' and that administrative guidance in the special circumstances prevailing in Japan could therefore be regarded as a governmental measure enforcing supply restrictions." The Panel concluded that: "in the above circumstances, the Japanese Government's measures did not need to be legally binding to take effect, as there were reasonable grounds to believe that there were sufficient incentives or disincentives for Japanese producers and exporters to conform" (WTO, 28).

This decision is important in the sense that many believe that China's membership to the WTO would have a very important impact on China's accountability for its future administrative behaviors. "For example, if China imposed technical regulations that could be proven to be motivated by protectionism, the case could be brought before the WTO's dispute settlement body. This authority could then impose fines if China was unwilling to comply with these rules" (Dolles and Wilmking 2005, 9-10).

However, this report's conclusion is that China's WTO membership has not brought a leading edge policy change for China, but China has chosen to change its

strategies through trial and error and deterrence of international criticism, within the restrictions of the WTO. Given the WTO case law, although, China's new strategies might violate the rules of the WTO. However, China apparently attempts to overcome these difficulties by supporting coalitions around its home-made standards initiatives. At this point, from the examination of the recent disputes between China and other countries, it is viable to say that direct counter-actions by foreign governments appear to be more challenging for the Chinese government.

According to (Slater 2009, 10): "[Chinese agencies and the officials] are still learning and experimenting." Given China's goal of becoming a high technology country, as Weber, Bach and Newman (2005) has quoted from one Chinese commentator who once precisely put it: "we are at the beginning of the standard game, not the end" (cited in Oh and Lee, 2008).

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